VOLUME 39
NUMBER 11

NOVEMBER, 1952

plating

BRAZING OF STAINLESS STEEL

See Contents Page 1217

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CLEPO 10-D PROCESS

FOR CLEANING AND BURNISHING STEEL PARTS IN ONE OPERATION WITHOUT USING BURNISHING SHOT

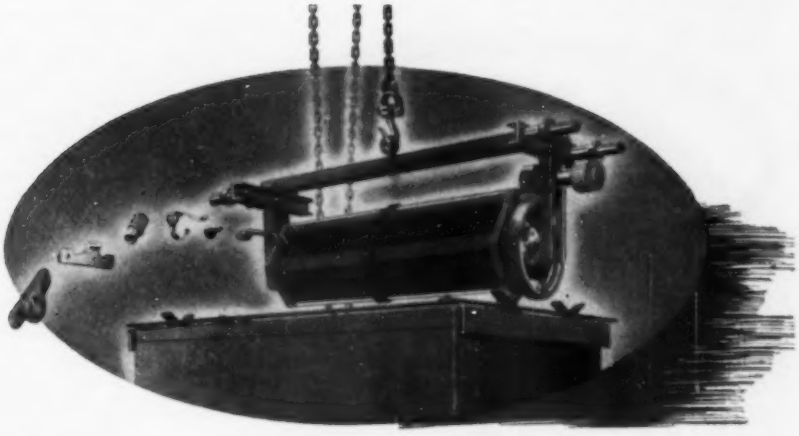
The Clepo 10-D Process greatly reduces the operation time and also the high cost of the conventional method of soak cleaning plus ball burnishing.

The Clepo 10-D Process is adaptable for use in either oblique or horizontal steel tumbling barrels. Oblique barrels are usually preferred because of time saved in rinsing, loading, and unloading operations.

We will be very glad to arrange a demonstration of this process at your convenience at your plant.

FREDERICK **GUMM** *Chemical Company Inc.*

538-542 Forest St., Kearny, N. J.



Plating on Aluminum made EASY with Alumon

Hundreds of manufacturers throughout the United States are now using electroplated aluminum. The Alumon process is simple. The work is merely cleaned, dipped in acid, dipped in Alumon and is then ready for electroplating with copper, nickel, and other metals. The process is suitable for plating most wrought and cast alloys. . . The cost of using Alumon is low, being less than half a cent per square foot of surface area treated. The process can be fitted easily into regular plating cycles. Bulk or barrel plating readily done. Upon request we'll gladly send you the Alumon Process Bulletin.

Write for literature on Alumon and check list of literature on sixty Enthone products and processes for better metal finishing.

*TRADE-MARK REG. U. S. PAT. OFF. MANUFACTURED UNDER U. S. PATENT 2,142,564.

METAL FINISHING PROCESSES

ENTHONE
INCORPORATED

ELECTROPLATING CHEMICALS

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NEW HAVEN, CONNECTICUT

Put them INTO your Plating!

Get more and better plating for less

With complete control of the sequence plus the conveyor handling of the parts, a Meaker machine gives greater production, reduced costs, uniform predetermined quality and less turnover in personnel due to better working conditions. Meaker equipment is tailored to the job requirements in plating, anodizing, pickling and cleaning, bonderizing or other processes involving a sequence of washes, rinses, and dips. Get full particulars from The Meaker Company, 1629 South 55th Avenue, Chicago 50, Illinois.

MEAKER

- Full Automatic and Semi-Automatic Electroplating Equipment
- Strip Steel Plating Equipment
- Wire Galvanizing Equipment
- Strip Steel Electrocleaning Lines
- Pickling Machines
- Processing Conveyors
- Motor Generators for Plating
- Rectifiers for Plating

MEAKER PRODUCTS

Meaker Return-Type Automatic Plating Machine

PLATING EQUIPMENT FOR OVER 50 YEARS

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In This Issue

Plating as an Aid in the Brazing of Stainless Steel by A. Korbelak and E. C. Okress describes a method for the use of nickel plated coatings in the manufacture of large-sized electronic tubes constructed of stainless steel, copper, etc. The locking of slug lines and voids for high vacuum work is illustrated. Included are tabular summaries outlining various thicknesses of plated nickel for indicated brazing times and temperatures.

International Conference on Hot Dip Galvanizing by Allen T. Baldwin. A review of all the papers presented at the Conference held at Dusseldorf, Germany this past summer. In the presentation of the papers each author was given a short period of time in which to introduce his paper—with emphasis on the reasons for its presentation and the points in the paper that he felt would be of most use to the audience.

Presentation Address—Carl Heussner Memorial Award by James Zeder. A memorializing story of Carl Heussner told by Chrysler Corporation's Vice-President and Director of Engineering and Research. It was originally delivered at the Chicago Convention with the presentation of the industry's top honor award—the A. E. S. Gold Medal. Now permanently endowed by United Plater's Inc., this award was granted to Dr. Edward A. Parker for his paper on gold plating.

Philadelphia Branch, Host for 40th Annual A. E. S. Convention is the second installment of the 1953 "Philadelphia Story" in which the history of the Philadelphia group since its first meeting 42 years ago is traced, along with an outline of the various contributions by its members in the growth of the local group and the parent body.

Disposal of Plating Room Wastes. IV. Batch Volatilization of Hydrogen Cyanide from Aqueous Solutions of Cyanides by Dr. Barnett F. Dodge and Walter Zabban. A continuation from the October issue of a Research Report on work conducted at Yale University under Project No. 10. It presents some results from laboratory and pilot plant studies on a process described as one of the important methods now used for the treatment of cyanide wastes.

For page number, see Table of Contents, page 1217.

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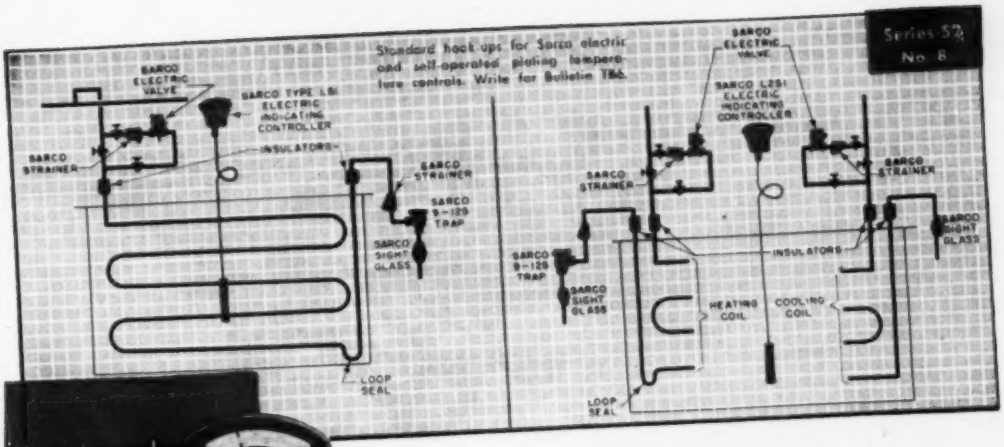
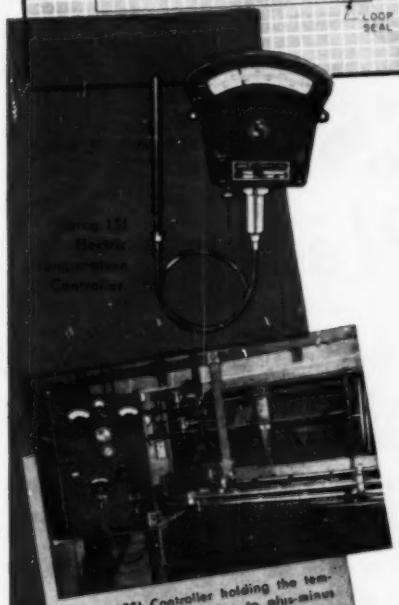
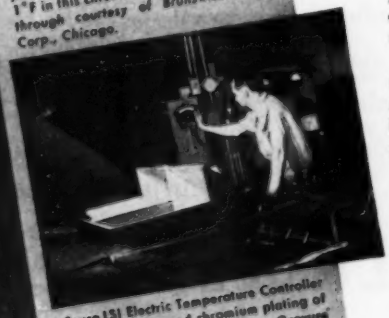


SIMPLIFIED
temperature control for electroplating



Sarco L2SI Controller holding the temperature of the solution to plus-minus 1°F in this chromium plating tank. Photo through courtesy of Brunswick Radio Corp., Chicago.



Sarco LSI Electric Temperature Controller used in copper and chromium plating of rotogravure rolls at Southern Gravure Service, Louisville, Ky.

● PERFECT PLATING depends upon close control of several variables, of which temperature is one of the most critical.

In the case of chromium or nickel, it must be easy also for the operator to change to a higher or lower temperature setting for different jobs.

Sarco indicating electric controllers, type LSI, fulfill these requirements at surprisingly low cost. No compressed air is required, no charts to change. The controlled temperature is held within plus-minus 1°F as continuously indicated on an easy-to-read dial. To change the setting, merely turn a knob.

A similar Controller, the L2SI is equipped with two independent switches to control both heating and cooling as is usually required in anodizing, hard chromium, bright nickel and other electroplating processes which generate heat.

Full information in Technical Bulletin No. 6

SARCO COMPANY, INC
Empire State Bldg., New York 1, N.Y.
Sarco Canada Ltd., Toronto 8, Ontario

Sarco Type TR-22, a simple self-operated temperature regulator recommended for copper, bronze, nickel, zinc, tin plating and acid pickling tanks in which critical temperature control is not necessary and settings are not changed frequently.

SARCO saves steam
improves product quality and output

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For FASTEST Cadmium Plating

USE ROHCO 50 XL CADMIUM BRIGHTENER!

DEVELOPED exclusively for still, semi-automatic or full automatic cadmium plating. ROHCO 50XL lets you use maximum current for highest production. Gives beautiful deposits with freedom from burning. ROHCO 50XL is easy to control, shows excellent throwing power for uniformity of deposit thickness and high covering power for plating in deep recesses. Send us a pint sample of your present bath for FREE analysis and recommendations!

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CANADA: Armalite Company, Ltd., Toronto 6, Canada

Every Bright Concentrated Cyanide Copper Bath Needs FORCITE ANODE BASKETS

because

1. They give smoother deposits, easier buffing with consequent lower cost
2. They give greater anode area, pass more current, permit larger loads and increased production
3. They allow any pure copper, such as balls or scrap, to be used

Fabricated from reinforced steel, the Forcite Anode Basket is completely coated with an inert, insulating material. Its tapered construction is ideally suited to give continuous electrical contact to the anode mass without requiring replacement of "contact" anodes. Contact is made by perfectly shielded, inert conducting blocks the entire depth of the basket and coupled to the anode bars. Cotton bags are included.

Forcite Anode Baskets are available in 24" or 30" lengths; other lengths on special order.

(Patent Pending)

Save Valuable Metals—Reduce Anode Costs!

SCIENTIFICALLY DESIGNED BY PLATERS FOR PLATERS!

OTHER ROHCO PRODUCTS: ROHCO 100 BARREL ZINC BRIGHTENER • ROHCO 303 STILL ZINC BRIGHTENER • ROHCO 20XL CADMIUM BRIGHTENER • RINS-AID • CURRENTESTER • NO-CRO-MIST® • HULL CELL TEST SETS AND RECTIFIER UNITS • ZINC PURIFIER • HANGING HULL CELL • ADDITION AGENT PUMP • AIR CRAFT BLACK CADMIUM DIP

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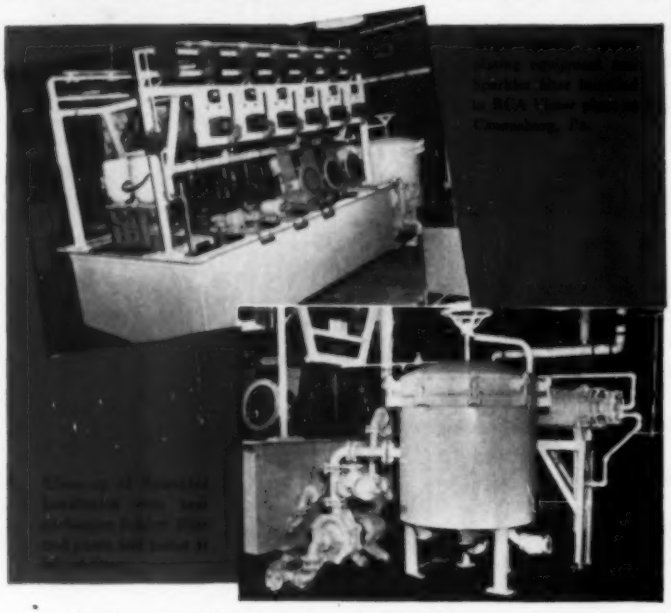
with an assist from

SPARKLER FILTERS



Sparkler filters installed in the Radio Corporation of America's phonograph record plants are one of the reasons why all RCA Victor recordings so faithfully reproduce the tone and quality of the original sound.

Here's why: One of the initial steps in this manufacturing process is the production of a large number of molding dies. The first die is made by electroforming an exact negative of the original soft lacquer recording; then, other electroforming operations produce the additional dies needed.

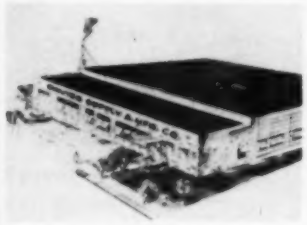
Since the smoothness of the grooved surfaces is one of the factors that determine the amount of noise produced by the record when played, and since any foreign particles in the plating solutions will introduce roughness into the electroformed parts, it is obvious that extremely clean nickel and copper plating solutions must be obtained.

Sparkler handles this job easily, because the horizontal plate principle is especially designed to provide finest quality filtration under all types of operating conditions. Operators know that there is never any variation in quality with a Sparkler filter, even under fluctuating pressures or intermittent operation, since filter cakes are built up uniformly on horizontal plates. High flow rates, easy cleaning, complete portability, extremely low maintenance and operating costs, and minimum "down-time" — are other Sparkler features "tailor-made" for the plating industry.

Contact your Sparkler representative today, or write Mr. Eric Anderson for full information or engineering assistance.

Industry News

New Home for Davies Supply & Mfg. Co. Davies Supply and Manufacturing Company, supplier of industrial plating and polishing equipment and materials in the Southwest, are now located



in an ultra-modern new home especially designed and constructed for the Davies firm at 4160 Meramec St., St. Louis, 16.

Besides the general offices, the new structure contains over twice as much warehouse and shop space as the former quarters at 2315 Delmar Blvd., St. Louis.

New Beckman Instruments Plant. The engineering and architectural firm of Donald R. Warren Company, Los Angeles, has been retained to design the new main plant and offices for Beckman Instruments, Inc., South Pasadena, Calif., which will be erected on a 45-acre site in the La Habra-Fullerton area. Plans call for an expandable design with an initial floor space of 200,000 square feet.

Helipot Corporation, a wholly owned subsidiary, will also move to the new plant, which will consolidate operations now carried out in the two original plants in South Pasadena and in approximately 14 additional locations in that area which have been leased to accommodate the rapid growth of the firms.

Paint Losses Eliminated. The development of an automatically controlled, conveyorized dipping process for quantity production of baked enamel and lacquer finishes of metal parts for industry is announced by the Apex Stamping Company, of 70 Marshall St., Newark, N. J.

SALESMEN

Manufacturer's representatives for Chicago and/or St. Louis areas to represent a well-established, progressive manufacturing organization, in the sale of metal-finishing supplies, patented, pressure-cooled buffing wheels, abrasive compositions, contact wheels, etc. of the highest quality. Permanent only.

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WITH America's most complete line of Polishing, Buffing, and Deburring Machinery.

Rotary and Straitline Automatics—Junior Automatics—Polishing Lathes and Backstands—Contour, "OD", and Abrasive Belt Finishers.

FOR Household Appliances, Hardware, Brass Goods, Automotive and Aircraft Parts—Gears, Bezels, Plumbing Supplies, etc., also for special applications.

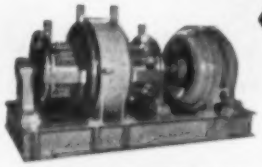
We have a Factory-Trained Engineer in most sections. Why not have him call and discuss your finishing problems—No obligation.

See us at Booth 1130—National Metal Exposition

Hammond Machinery Builders INC

1613 DOUGLAS AVENUE • KALAMAZOO, MICHIGAN, U. S. A.

COLUMBIA



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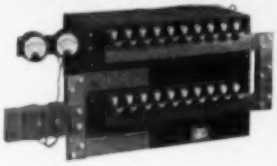
for Electroplating, Anodizing, Electrocleaning, Electropolishing



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- TONG TEST AMMETERS

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Cut Out the Mineral Acid Hazard... and get Better Descaling and Derusting!

Before Pickling

After Pickling with Magnus D-Scale-RS

USE A SAFE MATERIAL that won't attack either the metal parts being treated or the metal of the equipment. Use a material that doesn't give off fumes . . . that is safe for your workers to handle, and is safe in storage. Use Magnus D-Scale-RS, the inhibited *crystalline* acid for derusting and descaling.

Inert Until Dissolved in Water

D-Scale-RS is chemically inactive until dissolved in water. *Then* it becomes a highly effective pickling acid that does a better job than mineral acids. It readily attacks rust and scale, but its built-in inhibition against attack on metals prevents excessive acid action, so often encountered when ordinary acids are used. It can be used in either hot or cold solution.

Use in Barrels or Tanks

Magnus D-Scale-RS can be used in barrels for descaling and derusting, as well as in tanks of any size.

WRITE FOR BULLETIN 36 if you are interested in new standards of safety in pickling.

MAGNUS CHEMICAL CO. • 41 South Ave., Garwood, N. J.
In Canada — Magnus Chemicals, Ltd., Montreal.
Service representatives in principal cities.

Magnus
CLEANERS • EQUIPMENT • METHODS

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Industry News

As a result of this new development, known under the name of the Steingetz System, the paint loss which runs up to as much as 85 per cent in the conventional spray method for enamel finishes, has been completely eliminated. The new method also provides for controlled uniformity, complete overall coverage, thorough baking, and the elimination of all drip and tear marks. The Steingetz System has been licensed exclusively to the Apex Stamping Company.

"Automation" at Metal Show. The National Metal Show exhibit of Frederic B. Stevens, Inc., featured a Stevens Full Automatic Barrel Plating and Processing Machine in constant operation as an answer to the question of how to apply a phosphate coating to shells at a low cost.

30 cal., 45 cal. and 50 cal. shells were passed through various cycles of the phosphating operation just as in an actual defense plant operation. The exhibit included a conveyor for the return of the shells, after they had been automatically unloaded, to the automatic loader, at which point they were put through the same cycle again.

New West Coast Plant for American Chemical Paint Company. The American Chemical Paint Company announces that it has acquired office and plant facilities located at Niles, Calif., about 25 miles southeast of San Francisco. Present plans include the production of metal-working chemicals (rust proofing and paint-bonding phosphate coating chemicals, pickling acid inhibitors) and agricultural chemicals.

Heading up the Niles' ACP branch will be Mr. George H. Williamson of the American Chemical Paint Company's Detroit, Mich., office. In addition, field representatives will provide technical servicing and consultation for ACP customers in the West Coast area.

New J. J. Siefen Distributor. The J. J. Siefen Company, 5657 Lauderdale, Detroit 9, Mich., announces the appointment of **Len Pravel, Inc.**, 6121 Wood-

EXPERIENCED PLATERS

Good situation open for right men in Atlanta, Georgia. Prefer men with experience on automatic machines. Should be able to analyze and maintain zinc and cadmium solutions and to supervise rack maintenance. Salary commensurate with qualifications. Include qualifications, personal history, references, availability, and salary requirements in first letter. All replies held in strict confidence. *Reply to:*

P-1152-B, PLATING
445 Broad St., Newark 2, N. J.

after years of rugged field tests . . .

COMPLETELY SEALED Sel-Rex PLATING RECTIFIER

proved absolute protection against

CORROSION • DIRT • MOISTURE

About a year and a half ago one of the nation's largest manufacturers* of automotive equipment commissioned BART-MESSING CORPORATION to build several large rectifiers (over 10,000 amps each) that would withstand a highly corrosive atmosphere in one section of their plating division. Sel-Rex designed and built the first completely sealed, water cooled rectifiers and they were immediately put in operation. In all this time the cabinets were *never opened.*

After 18 months of continuous service, the rectifiers were recently opened to examine the interior. Here are the results:

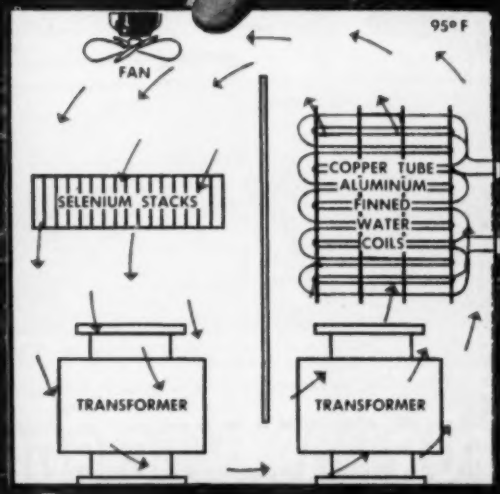
1—Absolutely no sign of corrosion in the interior.
2—No dirt or dust on the stacks.
3—No cleaning necessary.

CONCLUSION: SEL-REX engineers and customers are thoroughly convinced that SEL-REX water cooled, sealed rectifiers are the only answer to peak efficiency plating in plants plagued with highly corrosive conditions. Proof is evidenced in the excellent operating service of the many SEL-REX water cooled rectifiers now in operation.

*name upon request

- **SEALED-IN CLEAN AIR** Air within SEL-REX unit sealed against outside corrosive atmosphere.
- **CONSTANT TEMPERATURE** Air sealed in unit is maintained at constant temperature by air circulation through water cooled coils (maximum temp. 95°F).
- **WATER OUT** can be used for rinse purposes
- **WATER IN** obtained from normal source

INDICATE A 1309.



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BART-MESSING CORPORATION

NEMA

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Industry News

lawn, Chicago 37, Ill., as exclusive distributors in Wisconsin and Illinois for their polishing and buffing products.

Len Pravel, Inc., is owned and operated by Leonard E. Pravel, who has acted as representative for various companies in the finishing line for several years.

New Kelite Plant in Berkeley Heights, N. J. Kelite Products, Inc., manufacturers of cleaning and processing compounds and steam cleaning machines, has completed its new factory and sales offices at Berkeley Heights, N. J. William Sorensen is the Vice-President in Charge of Manufacturing and Sales for the Atlantic Division. Headquarters of Kelite are in Los Angeles with additional plants in Chicago and Dallas, and Service Offices in 86 principal American cities and 15 countries abroad.

Cold Cleaner. A new "cold cleaner" consisting of a two-phase combination of Houghto-Clean No. 439 and Houghto-Clean No. 440, operated in power washers at room temperatures, was featured by the E. F. Houghton & Company, 303 W. Lehigh Ave., Philadelphia 33, Pa., in its exhibit at the recent National Metal Show.

This cleaner leaves a very slight rust preventive film on the work; therefore has the dual advantage of not requiring heating facilities and leaving the work safe for subsequent operations without the danger of corrosion.

Ronson Enters Aircraft Accessory Parts Field. To fulfill an increasing number of sub-contracts for aircraft accessories, Ronson Art Metal Works, Inc., of Newark, N. J., manufacturers of Ronson lighters, has equipped a new and additional plant.

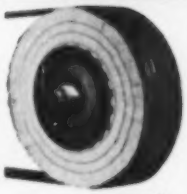
The new plant is a one-story building with 32,000 square feet of floor space. A railroad siding adjoins the rear of the new structure. With a view to expanding this program for both defense work and special products for civilian use as well as military application, a separate staff for production, engineering, and purchasing activities is provided. As a result, the special products division of Ronson will be an integral organization, complete in itself.

New Udylite Warehouse. The Udylite Corporation announces the opening of its new warehouse located at 2818 Belgrade, Philadelphia, which features a time-saving drive-in and pick-up service. This newest addition to the Udylite sales network handles a complete line of products and chemicals, and has approximately 10,000 square feet of floor space.

Tacoma Boy Wins Pennsalt Scholarship. Philip H. Fisher, son of Harry S. Fisher, a chemical engineer at the Tacoma plant of the Pennsylvania Salt Manufacturing Company, of Washington, has been awarded the 1952 college scholarship provided by George B. Beitzel, Pennsalt president.

One such award is made each year to a son or daughter of a Pennsalt employee who is selected by an independent board of educators. The scholarship provides $300 a year for four years of study toward a bachelor's degree at an accredited college or university.

A FEW OF THE MANY
FORMAX
PRODUCTS



STYLE C-20 CONTACT WHEELS
and F-26 Belt Lubricant

A C-20 flexible Contact Wheel will form itself to the shape of the work and permit the abrasive belt to polish contoured surfaces and F-26 Abrasive Belt Lubricant will increase belt life by preventing loading and glazing. Produces finer, smoother and brighter surfaces through lubrication.

ZIPPO BUFFS

These famous long-wearing buffs run cool under all buffing conditions. Constructed of high count bias-cut cloth or sisal mounted on safe steel centers. Available in a wide range of densities and center diameters.

A complete line of buffing compounds in bar form as well as in liquid form for brush or spray application. Also Flex-A-Glu polishing wheel cements.

Our Laboratory and Sales Engineering staff would welcome the opportunity to be of help in solving your finishing problems.

Send for descriptive literature

FORMAX MFG. CORP.
DETROIT 7, MICHIGAN
"THE FOUR McALEERS"

MANUFACTURED IN CANADA BY JOHN GALLOWAY LTD., KITCHENER, ONT.

SALES REPRESENTATIVE
CLEVELAND AREA

Well established nationally known manufacturer of complete line polishing and buffing compositions requires jobber or commission salesman with experience and contacts. Have many established accounts this territory at present. *Reply to:*

P-1152-C, PLATING
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WANTED

Research Associate of American Electroplaters' Society to work at National Bureau of Standards on permeability and protective value of electroplated coatings. College graduate. Salary $3400–4200 per year. Application should include qualifications and minimum acceptable salary. *Reply to:*

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445 Broad St., Newark 2, N. J.

In Metal and Alloy Plating

INCREASE OUTPUT! LOWER YOUR COSTS!

with **B&A FLUOBORATE PLATING CHEMICALS**

LEAD
TIN
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FLUOBORIC ACID

*Experimental Quantities Only

For plating airplane and other heavy-duty bearings.
For coating copper and steel wire.
For plating rotogravure cylinders, stereotypes, electrotypes.
For barrel-plating of hardware, housewares.
For plating battery terminals.
For decorative finishes on jewelry, other accessories.
For plating radio and electronic parts.

Important practical advantages B&A Metal Fluoborates offer you:

- ✓ No mixing or dissolving necessary . . . supplied in concentrated solution form
- ✓ Easier bath preparation
- ✓ Stability of bath composition
- ✓ Ease of control
- ✓ Practically 100% anode and cathode efficiencies
- ✓ High conductivity
- ✓ Fine-grained deposits of good color
- ✓ Good covering power
- ✓ Faster, high-speed operation

AND MANY MORE—

In addition to these general operating advantages, each B&A fluoborate bath has a number of special advantages for its particular applications.

For operating data, experimental or commercial quantities—or for free technical consultation—write or phone the nearest B&A office.

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*Complete stocks are carried here.

REAGENTS
B&A
STANDARD OF PURITY
FINE CHEMICALS

No more *sleepless nights worrying about "downtime"...*

You'll sleep better, and your manufacturing operations will be better *and more continuous* once you've installed corrosion-resistant, saran lined steel pipe. Downtime will be cut to a minimum, because this rigid pipe has high pressure strength and durability which mean dependable, long-term service. Easily installed saran lined steel pipe can be cut and threaded in the field—no need for special tools or handling. Be sure to consider saran lined steel pipe wherever superior resistance to most chemicals and solvents is demanded. *Saran lined steel pipe is manufactured by The Dow Chemical Company.*

install corrosion resistant

SARAN LINED steel pipe

Write to the Distributor:

SARAN LINED PIPE COMPANY

2415 BURDETTE AVENUE • FERNDALE, MICHIGAN

Offices in: New York • Boston • Pittsburgh • Tulsa Philadelphia • Chicago • Portland • Indianapolis • San Francisco • Houston • Denver • Los Angeles • Seattle Cleveland • Charleston, S. C. • Toronto • Montreal

RELATED PRODUCTS

Saran rubber tank lining—an outstanding lining where resistance to grease, many solvents, acids and other chemicals is indicated.

Saran rubber molded parts—stoppers, diaphragms, various-sized moldings for valves, instruments, etc.

Clip and send today!

Saran Lined Pipe Company
2415 Burdette Avenue, Ferndale, Michigan
Please send me a copy of your catalog on Saran Lined Pipe, Valves and Fittings.

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SARAN LINED PIPE
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Society News

A. S. T. M. Committee B-8

In cooperation with our Editorial Board and other interested organizations, A. S. T. M. Committee B-8 is developing a glossary of terms used in plating, polishing and allied operations. The committee will continue to review proposed Federal specifications pertaining to electroplating. In the interest of uniformity within the committee a suggested format for recommended practices for the preparation of materials for electroplating is being prepared.

Additional test panels are being prepared for exposure tests in the copper-nickel-chromium series. Supplemental treatments to zinc and cadmium coatings are also being evaluated. In connection with these exposure tests present methods now used in rating test panels will be reviewed with particular attention being given to the placing of proper emphasis on various defects as they relate to the true protective value of the coatings.

Properties of electrodeposits currently under study include thickness, hardness, adhesion, brittleness, and luster. Four new recommended practices are anticipated in the near future as follows:

1. Preparation of copper and copper base alloys for electroplating
2. Plating on plastics
3. Preparation of lead and lead alloys for electroplating
4. Preparation of malleable and gray iron for electroplating

A. S. T. M. Elections

The American Society for Testing Materials has announced the election of Robert J. Painter as Executive Secretary and of Raymond E. Hess as Associate Executive Secretary.

Hess has been Technical Secretary and Editor for this national technical society for many years. Painter most recently has been Treasurer and Assistant Secretary. Both are located at the A. S. T. M. National Headquarters Building on Philadelphia's Parkway.

Painter is a graduate with a degree of Civil Engineer from Rensselaer Polytechnic Institute, and Hess also is a Civil Engineering graduate from the University of Pennsylvania.

WANTED

Chemical Salesmen, metal finishing, to sell cleaners and chemical treating compounds, plating supplies and equipment to industrial plants, New York area. Experience and following required. Send Resume.

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1—4000/2000 AMPERE, 6/12 VOLT, **BOGUE**, Synchr. Motor.
2—2000/2500 AMPERE, 9/18 VOLT, **ELECTRIC PRODUCTS**, 25° C. Synchr.
1—5000/2500 AMPERE, 9/18 VOLT, **CHANDEYSSON**, 25° C. Synchr. Motor.
1—5000/2500 AMPERE, 6/12 VOLT, **EAGER**.
1—3000/1500 AMPERE, 6/12 VOLT, **HANSON-VAN WINKLE-MUNNING CO.**
1—2500/1250 AMPERE, 6/12 VOLT, **HANSON-VAN WINKLE-MUNNING CO.**
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Personals

Raymond Dearth has joined The Udylite Corporation as Sales Engineer for the Northern Indiana area.

Before joining Udylite, Mr. Dearth, a Chemical Engineer, was with the Anderson Company, Gary, Ind., as a Rubber

Dearth

Technician and Metal Finishing Engineer. He spent five and one-half years in the U. S. Army during World War II. Prior to his Army service, he was associated with both the U. S. Rubber Company and the Firestone Tire and Rubber Company.

O. H. Tiedeman has been elected to the Board of Directors of Wagner Brothers, Inc., Detroit, as Vice-President in Charge of Sales. Mr. Tiedeman joined the company in 1947 as a sales engineer handling the Wagner-Tiedeman Electroplating Rec-

Tiedeman

tifier which he developed. Since then, Tiedeman has been Chief Engineer and Operations Manager.

Mr. Tiedeman came to Wagner Brothers from Radio Controls, Inc., New York, where he was Chief Engineer. Previous to this he was with the U. S. Army Signal Corps Development Laboratories at Fort Monmouth, N. J. He received formal training at Pratt Institute.

Thorman R. Hulse, formerly in research and development, General Electrical Company, has been appointed Production Manager of Alfred Bicknell Associates, Inc., manufacturers of Scientific Apparatus, Cambridge, Mass. Mr. Hulse will assist **Dr. Frederick G. Keyes,** Director of Research, in new instrument production planning.

Stephen T. Orr, Vice-President of Wyandotte Chemicals Corporation and for 25 years in charge of the Company's manufacturing and operating activities, has been made a member of the president's staff with the rank of Vice-President.

He is succeeded in his manufacturing responsibilities by **Frank Wolcott,** his immediate assistant, who becomes General Manager of Manufacturing, Michigan Alkali Division. Mr. Orr, who joined Michigan Alkali in 1906 when he was graduated from Michigan State College, succeeded his father, William T. Orr, as General Manager in 1927.

Mr. Wolcott joined Wyandotte two years ago as general manufacturing manager, having come to Wyandotte from the New Jersey Zinc Company.

David Laine, Secretary of the American Die Casting Institute, Inc., has been granted the annual Doehler Award, highest award of the die casting industry for

Laine

outstanding achievement contributing to the advancement of the die casting industry.

The annual award, made possible by a fund set up in 1949 by the Doehler-Jarvis Corporation, carries with it a cash honorarium of $1,000. The award has been made twice previously.

Joe Hauser Shockcor has been named sales engineer by Enthone, Inc., New Haven, Conn. Mr. Shockcor is a native of

Shockcor

Pennsylvania and received his B.S. degree in Chemical Engineering from Lehigh University in 1950. He was employed in the research laboratories of Enthone, Inc., for two years. He will service Enthone products in eastern Pennsylvania, Maryland, Delaware, Washington, D. C., parts of Virginia and Tennessee.

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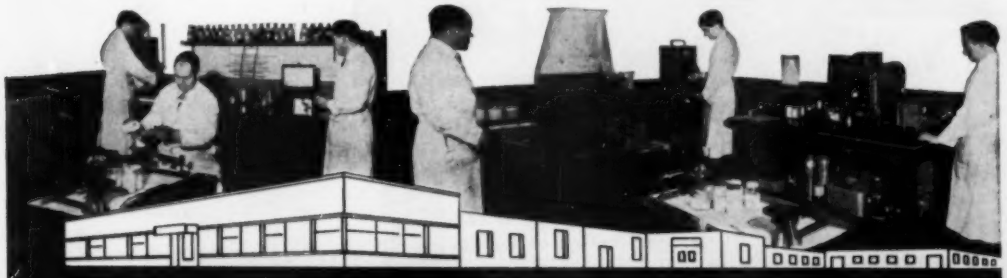

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Personals

L. Camel has been promoted to the position of Divisional General Sales Manager of the Industrial Chemical Division and **D. E. Williard** to Divisional General Sales Manager of the Industrial Equipment Division according to an announcement by the Detrex Corporation.

In photo, left to right: D. E. Williard, W. F. Newbery, L. Camel

Mr. Camel will direct the sale and service of the Chemical Division products which include: emulsions and alkali cleaners, strippers and spray booth compounds; phosphate coating processes for rust-proofing, paint bonding and the cold extruding of steel; and the silicone coating removal processes and cleaning compounds for the Food Processing Division.

Mr. Williard will control the sale and service of the Detrex line of solvent degreasing machines and solvents, and the mechanical washers used in industrial production cleaning.

Dr. Fred Gurnham has been appointed Professor and Head of the Department of Chemical Engineering at Michigan State College, East Lansing. He had served in a similar capacity at Tufts College for four years.

In the past Dr. Gurnham was actively concerned with A. E. S. Research Project No. 10 and held various Branch offices including the Presidency of the New Haven Branch.

Ralph O. Bettison has been appointed Field Engineer in the Pontiac, Mich., area by The Bellows Company, Akron, Ohio.

Bettison **Vaughn**

Formerly employed by Reo Motors, Lansing, Mich., he has a varied and practical experience in Air and Hydraulics Maintenance Engineering and in the industrial applications of air power.

Clifford S. Vaughn has been named Assistant Western Regional Manager and will make his headquarters at their Home Office at 733 E. Pico Blvd., Los Angeles, Calif.

Patrick A. Cavuto, formerly in charge of the Electroplating Department of Muzak Corporation, has joined the Sales and Service Department of the Electroplating Division of United Chromium, Incorporated.

Cavuto

Before World War II, Mr. Cavuto, who attended the University of Rochester, was employed as Assistant Purchasing Agent for the Will Corporation, dealers in laboratory apparatus and supplies. During the war, he served in England with an Air Force fighter group.

Earl J. Mills has been appointed manager of the Chicago branch sales office Diamond Alkali Company, succeeding the late **Charles W. Klaus,** and **John W. Kennady** has been named manager of the Southwest District sales office, which has its headquarters at Houston, Texas.

The move will return to Chicago a sales executive well known in that area. From 1945 until 1949, Mr. Mills was

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manager of less-carload sales for Diamond at its Chicago office, transferring to the Southwest District Sales office as manager.

Kennady, the new manager of the Southwest sales office, comes to the Diamond sales organization from Kolker Chemical Works, Inc., a Diamond subsidiary, which he has been serving as district manager at Kolker's Houston plant.

James M. McWhirter, formerly Southern Works Manager for the Pennsylvania Salt Manufacturing Company, has been appointed Manager of the Wyandotte Works. Mr. McWhirter replaces **G. A. Nelson,** who is being assigned to general engineering and consultative work in connection with Pennsalt's current expansion and plans for future developments.

McWhirter, while a newcomer to Wyandotte, has had broad experience with the company and in industry. Coming to Pennsalt from the General Chemical Company, in July, 1945, he was assigned first to the Natrona, Pa., plant, and named Superintendent there in 1946. He assisted in engineering Pennsalt's hydrofluoric and sulfuric acid operations at Calvert City, Ky., and became the first Superintendent of that plant when it began operations in June, 1949. He later was named Southern Works Manager.

It was also announced that **Herman J. Eichenhofer,** formerly Assistant Superintendent at Wyandotte, has been named Superintendent of Pennsalt's new electrolytic chlorine, caustic soda and hydrochloric acid plant, now under construction at Calvert City.

J. T. Gormally, formerly Superintendent of the Cornwells Heights plant, was appointed Assistant to the Production Manager and will make his headquarters in the Philadelphia office. **Frank J. Power,** Assistant Superintendent, becomes Acting Superintendent at Cornwells Heights.

William H. Steinkamp has been appointed Vice-President and General Sales Manager of Beckman Instruments, Inc., South Pasadena, Calif. Steinkamp is well

Steinkamp

known in the industrial instruments and process control fields as a result of 22 years' association with the Brown Instruments Division of Minneapolis Honeywell Regulator Company where he served last as General Sales Manager, located in Philadelphia.

Obituaries

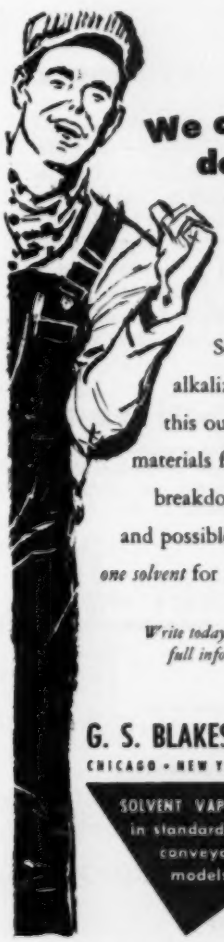
✣ **Frederick L. Curtis,** retired Vice-President of Raybestos-Manhattan, Inc., and former General Manager of the Manhattan Rubber Division, died September 20 at his home in Passaic, N. J. He was 84 years old.

Mr. Curtis was believed to be the oldest pioneer in the American rubber industry, having started as a shipping room boy with the New York Belting & Packing Company 70 years ago in Sandy Hook, Newton, Conn.

✣ **George G. Knecht,** District Manager in the State of Connecticut for the Hanson-Van Winkle-Munning Company, died suddenly of a heart attack on October 8, 1952. He had been in good health up to the moment of his death. He had been with Hanson-Van Winkle-Munning for the past thirty years, most of them in the Connecticut territory, having started with the old Hanson-Van Winkle

Knecht

Company. He was a long standing and very active member of the American Electroplaters' Society. He is survived by a daughter, a son, two brothers and three grandchildren.



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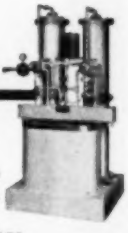
The engineering, design, and construction of INDUSTRIAL filters have proved out in long service. With the outlet near the top of the chamber, a uniform precoat is deposited on the filter leaves as the solution fills the chamber. The outside lockup simplifies the lockup of the leaf and bag assemblies. INDUSTRIAL exclusive air-wash cleaning method practically eliminates the usual labor, downtime, and the inconveniences of dismantling the filter after each cycle. INDUSTRIAL filters are often in operation for months without removing the cover. All these features add up to bonus performance—clear filtrate at low over-all cost per gallon.

Ask for Bulletin 100-EP

This bulletin gives the complete details of all INDUSTRIAL features, description of the different standard models, and the capacities of the standard sizes.

INDUSTRIAL Water Demineralizers



Eliminate stains after hot rinses; prevent unwanted precipitates in solutions.

Standard INDUSTRIAL demineralizer units are available with capacities of 200 to 1000 gph. Special units of any capacity are engineered to requirements.

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Trade Literature

L—899. Service Data Sheet—American Chemical Paint Company has issued a new chart listing the principal types of "Rodine" and describing their most important characteristics. For your copy of this selection chart on pickling acid inhibitors use Reader Service Card.

L—900. Materials and Processes Standards—General Motors Corporation now makes available to organizations or individuals for a nominal subscription charge their Materials and Processes Standards which cover GM specifications and material numbers.

Process data is for enhancing the characteristics of some of the included materials by giving methods of testing. Details on the acquisition of the Standards may be obtained through use of Reader Service Card.

L—901. Brochure on Wet Blasting—A new 6-page brochure, "Wet Blasting in Precision Finishing", has just been published by American Wheelabrator & Equipment Corporation, 1180 S. Byrkit St., Mishawaka, Ind. It shows the application of wet blasting to such work as tool finishing and deburring, heat treat scale removal, and surface preparation for plating.

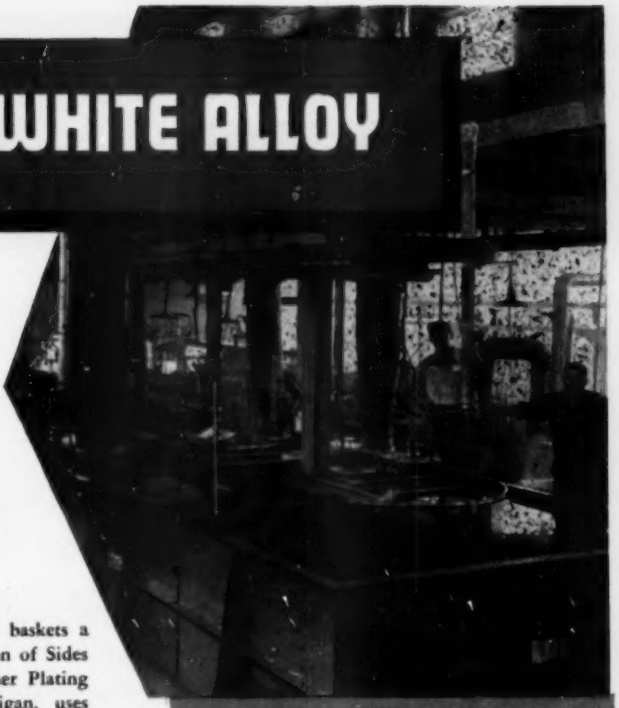
Fully illustrated, showing parts both before and after wet blasting, bulletin 43 is available through use of Reader Service Card.

L—902. Building up Worn Parts by Electrodeposition—A 6-page reprint by the International Nickel Company, Inc., cites the economies of salvaging worn or overmachined parts by plating to build up surface for repair. Twelve illustrations and tables. Advantages of using heavy nickel deposits are presented. Review is made of such technical factors as: hardness and strength of deposit, adhesion, stresses and uniformity of deposit thickness. How deposits affect properties of the basis metal (steel) and how to proceed with a repair are described. Advantages of nickel plating are contrasted with those of heavy chromium plating. For your copy use Reader Service Card.

L—903. The Effect of Copper Undercoats on the Protective Value of Nickel-Chromium Coatings on Steel—A reprint by The International Nickel Company, Inc., contains 12 pages, well illustrated and documented with tables. Gives the results of an 18-month study on high carbon steel panels plated with nickel-chromium and with copper-nickel-chromium coatings and subjected to various atmospheric and accelerated exposure

PROBRITE WHITE ALLOY

. . . answer to a tough job at Michner Plating Company



Joseph and Walter Michner, Michner Plating Company, Jackson, Michigan, looking over their fully automatic Probrite White Alloy line.

To plate 600 supermarket baskets a day for the Tote-Cart Division of Sides Manufacturing Co., Michner Plating Company, Jackson, Michigan, uses the Probrite White Alloy Process — production-proven alternate for copper-nickel-chrome.

Michner, a progressive firm that started 15 years ago as a small shop, has grown to be the largest independently owned plating concern in the Midwest. Their application of the Probrite White Alloy Process is added evidence that here, indeed, is an outstanding new finish for wire goods, hardware, tubular furniture, appliances, automotive accessories, tools and other products.

For complete information and technical data, write to Promat.

Brief Data on PROBRITE WHITE ALLOY

- For use directly over copper or steel.
- A bright-out-of-bath deposit.
- Over 200 hours resistance to red rust in salt spray.
- Plates easily at high current densities.
- Excellent covering power.
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NEW Probrite CR-723 Coloring Grade White Alloy . . . for use on parts that can be color-buffed. Very economical. Extremely easy to use . . . any shop can handle it. Write for data.

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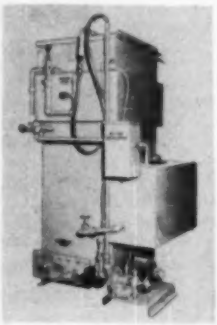
Trade Literature

tests. It concludes that, except in a carbon dioxide saturated hot water test, composite coatings of copper and nickel were inferior to solid nickel coatings of equal thickness. For your copy use Reader Service Card.

L—904. Vapor Degreaser Brochure—How Ramco vapor degreasing can be adapted to a wide variety of industrial cleaning problems is given comprehensive definition in an 8-page, illustrated brochure, just released by Randall Manufacturing Company, Inc., 801 Edgewater Rd., New York 59, N. Y.

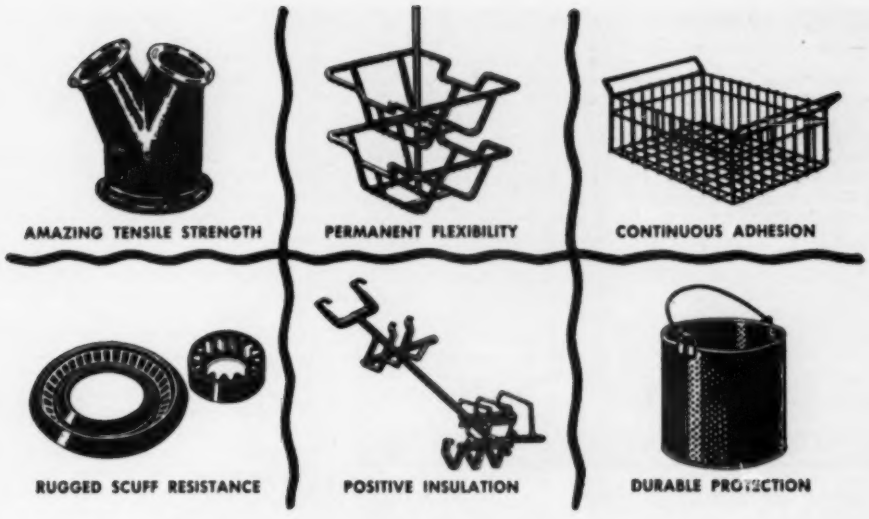


The brochure, liberally spiced with pictorial examples of degreasing equipment designed for compactness, efficiency and and economy, is available through use of Reader Service Card.

L—905. Portable Volt-Ammeter—The Columbia type AC-1 Volt-Ammeter, a recently announced instrument, is a clamp-type, hand-size unit for use on alternating current, that measures up to 600 amperes and 600 volts. Equipped with ranges of 0–12, 0–60, 0–120 and 0–600 amperes, 0–150 and 0–600 volts, the instrument is easily held and operated with one hand, weighing less than two pounds. Descriptive literature is available. Use Reader Service Card.

L—906. New Booklet—A new 16-page booklet issued by the Harshaw Chemical Company, 1945 E. 97th St., Cleveland 6, Ohio, gives a complete word and picture story of Harshaw's activities in the chemical field. For your copy of this interesting release use Reader Service Card.

L—907. Heat Treating Equipment Catalog—The new general catalog No. 52 of The Pressed Steel Company, Wilkes-Barre, Pa., features the company's line of heat-treating equipment. Generously illustrating the containers, fixtures and retorts more commonly used in carburizing, annealing, etc., the publication also



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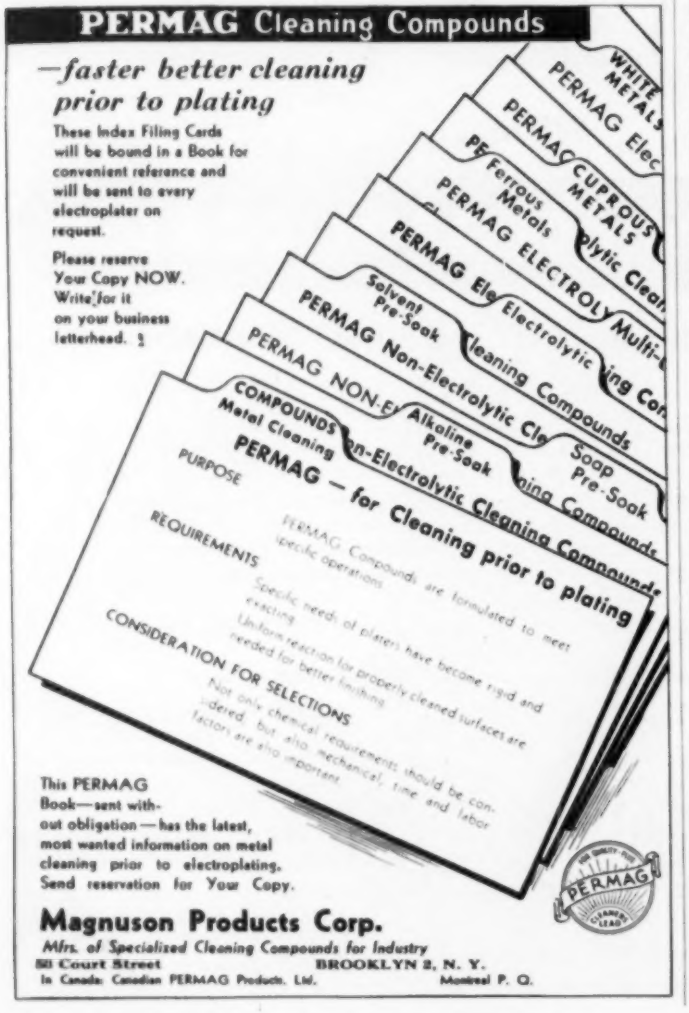
Trade Literature

contains a collection of installation views of new equipment which have interesting possibilities for saving handling and heating time. Also described are the various types of tubing for annealing, firing radiant furnaces, venting noxious gases, and protecting thermocouples. For your copy use Reader Service Card.

L—908. Electric Motor Catalog—The Louis Allis Company of Milwaukee 7, Wis., originators of the fan-cooled motor for use in hazardous locations, announces a new 12-page bulletin covering its line of explosion-proof motors. Fully illustrated, the bulletin shows in detail the special features built into Louis Allis explosion-proof motors, and typical uses for these units. It also shows many of the various electrical and mechanical modifications available. For your copy of this new bulletin No. 800 use Reader Service Card.

L—909. The Electrodeposition of Nickel from Nickel Chloride Solutions—A reprint by The International Nickel Company, Inc., contains 28 pages, 5 charts, 5 tables and illustrations. Compares nickel deposited from all-chloride solution with that from ordinary sulfate electrolyte and finds them of equal protective value. However, the nickel deposited from the chloride solution is of finer grain, harder, stronger and somewhat less ductile. Other advantages include indicated 50 per cent reduction in voltage and power consumption, higher efficiencies, ease of control and wide plating range. Also smoother, tougher, more easily buffed deposits and less pitting. For your copy use Reader Service Card.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L—910. Metal Surface Treating Bulletin—The various possibilities of advantageously using peroxygen compounds in the treatment of metal surfaces are outlined in a new bulletin No. 39 recently issued by the Buffalo Electro-Chemical Company, Inc., Station B, Buffalo 7, N. Y.

Four general types of procedures for treating metal surfaces with oxidizing agents are covered in the bulletin: (1) producing an oxide film on the metal surface; (2) removing undesirable components of the metal surface; (3) dissolving and removing metal from a metal surface; (4) keeping constituents of certain treating solutions in the proper state of oxidation. The actual or potential usefulness of peroxygen compounds as applied to each of these four treatments is described in some detail; various examples are cited. Copies of bulletin No. 39 may be obtained by using Reader Service Card.

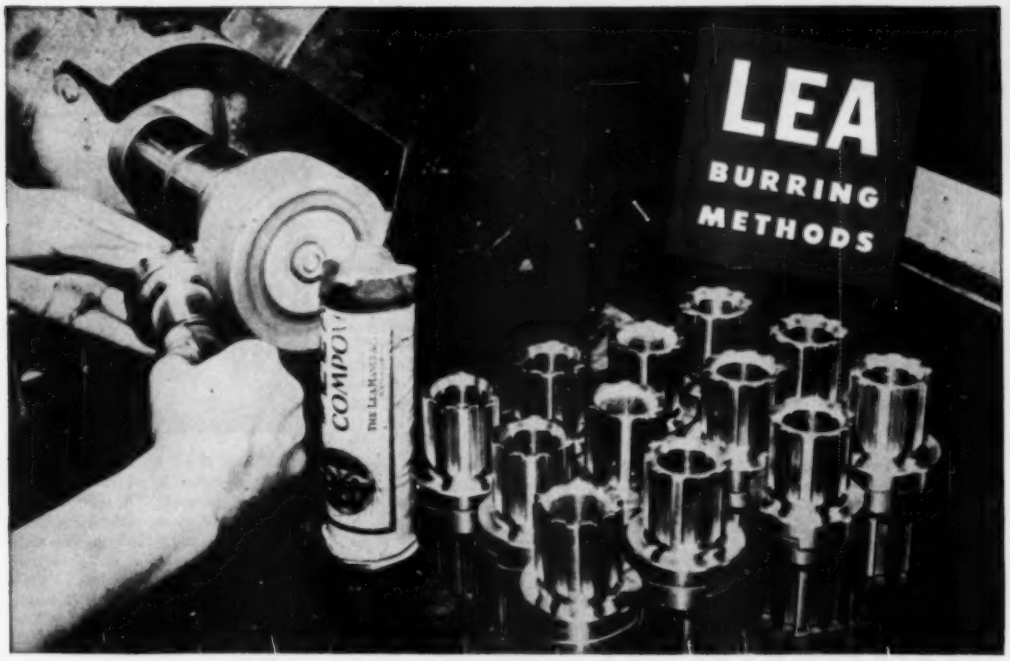
L—911. Temperature Control Literature—Thermo Electric Company, Inc., of Fair Lawn, N. J., has just published an 8-page catalog No. 55 illustrating and describing their new "Thermo Electronic" Signaling Temperature Controller and Resistance Bulbs. For your copy use Reader Service Card.

L—912. Metal Fluoborate Solutions—General Chemical Division, 40 Rector St., New York 6, N. Y., have issued a booklet, "Baker & Adamson Metal Fluoborate Solutions", which is of interest to all industries doing electroplating.

This new booklet outlines how these versatile plating solutions are being used in scores of applications to speed up output, cut operating costs and save scarce metals. Also included are data on the chemical and physical properties of the various B & A Fluoborate concentrates. For your copy use Reader Service Card.

L—913. Automatic Plating Equipment Bulletin—A completely new bulletin on the Stevens Automatic Barrel Plating and Processing Machine is now available. Complete descriptions of both the "C" and Super "E" models are included and several recent engineering developments in the field of automatic barrel plating are described and pictured.

The bulletin describes several special applications for this automatic barrel machine in detail, and pictures of its use for the phosphate coating of mortar shells and washing of small parts are included. For your copy of catalog No. 60 write Frederic B. Stevens, Inc., Detroit 16, Mich., or use Reader Service Card.



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THAN WITH HARD BURRS

Do cast or stamped parts you are finishing come to you with slivers, fins, rough edges, plugged holes, imperfect corners?

Look into the Lea Burring Method for fast and precise removal of such excess metal and straightening out of edges and surfaces. This method while used to some extent prior to World War II really came into its own when manufacturers were faced with really stiff specifications and close tolerances. The Lea Method helped many a company stay in war-contract business.

Since the war many companies retained the Lea Method of Burring in order to maintain high finishing standards. Now, there is an increasing demand for better preparation of surfaces on which finishing operations are to be performed. Now—as before—Lea is the method being adopted for removing burrs.

Our technical staff will be glad to help you make use of this proved method. Write in detail and, if possible, send us samples of pieces to be deburred for our recommendations.

Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions

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370 Victoria Street, Toronto 2, Canada

Manufacturers of Lea Compound and Learok, Industry's Quality Buffing Compounds for over Twenty-Five Years

Equipment and Supplies

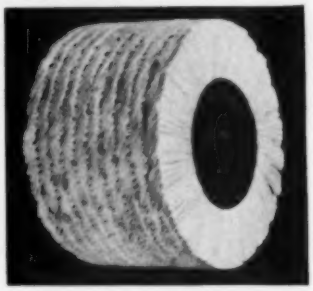
E—974. Electronic Temperature Controller—For accurately controlling operating temperatures ranging from minus 100° F to plus 600° F, Thermo Electric Company, Inc., of Fair Lawn, N. J., is introducing their newly designed "Thermo Electronic" temperature controllers using resistance bulb sensitive elements. These instruments are built with single or duplex control action and are available in six different temperature ranges. The standard resistance bulbs, designed for use with these controllers, cover practically all process applications. For further information use Reader Service Card.

E—975. New Detergent Cleans Aluminum, Magnesium—Rapid cleaning of aluminum, anodized aluminum and magnesium parts in power washing equipment is made possible with the development of a new detergent by Kelite Products, Inc. Known as PWB No. 81, the new detergent is a readily water soluble powder that affords complete removal of virtually all types of soil, including ink markings in approximately one minute. It is nonfoaming, non-corrosive, has extreme stability and long life. For complete information use Reader Service Card.

E—976. Pocket Measuring Microscope—Optometer tradenames a new 50 power fountain-pen size pocket measuring microscope of the National Instrument Company. An engraved scale mounted in the body tube reads directly to 0.002 inch. Estimations can easily be made to 0.0005 inch. For additional data use Reader Service Card.

E—977. New Type Buffing Wheel—The Geo. R. Churchill Company has developed a new type of finger buff called the "P-30" that is ideal for hand buffing and machine operation alike.

This new type buff is of a pleated construction that traps and holds the cutting compounds for all kinds of polishing and buffing requirements. Each

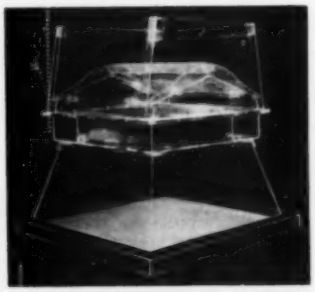


pleated buff finger is set at the proper angle on the wheel to prevent gouging or steaking of the work. The new "P-30" is produced in all types of cloth and in all sizes from 6-inch to 18-inch diameters. For further information and free samples, write to Geo. R. Churchill Company, 7518 Fayette St., North Quincy 71, Mass., or use Reader Service Card.

E—978. Safety Solvents—A complete series of safety solvents replacing carbon tetrachloride are now available in volume quantities, from Tect, Inc., of Englewood, N. J. Offered under the trade name Tecsolvs, ten different solvents can now be supplied for a great variety of uses in manufacturing, processing, and plant maintenance.

Low in toxicity, Tecsolvs may be used with vapor concentrations in the air 8 to 20 times greater than permissible with carbon tetrachloride. For additional data use Reader Service Card.

E—979. Roof Ventilation—A new power-type roof ventilator has been announced by the Iron Lung Ventilator Company of Cleveland 3, Ohio. Designed

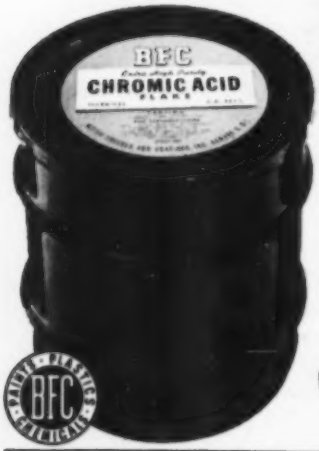


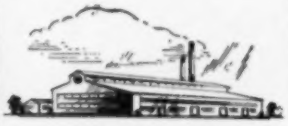
especially for complete resistance to the corrosive effects of acid fumes such as are created by pickling operations and first of its kind, this new plastic unit is made of

EXTRA HIGH QUALITY 99.7+% PURE

CHROMIC ACID

TECHNICAL GRADE—FLAKE





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polyester-resin reinforced fiberglass which is wholly unaffected by all common acids. For further information use Reader Service Card.

E—980. Aluminum Soldering Development—Chemalloy is a new development of Chemalloy Associates, Santee, Calif., which simplifies the soldering or welding of any aluminum or zinc-base metal including aluminum or galvanized coatings.

Chemalloy is used directly on aluminum without the use of any flux or special preparations. Tensile strengths greater than that of the aluminum itself are obtained. Additional information is available. Use Reader Service Card.

E—981. Nesting Parts Handling Basket—A welcome addition to any materials handling system has been announced by the Chas. Wm. Doepke Mfg. Co., Inc., of Rossmoyne, Ohio.

Called the NesTier Basket, it is a steel mesh basket designed for efficient handling and space saving during operations where small parts are being moved and dipped in chemicals, paints and other liquids. Rustproof and corrosion resistant, the baskets can be nested when not in use and tiered when filled with parts. Folding handles are located at either end of the baskets, which are available in two standard sizes. For further information use Reader Service Card.

E—982. Metal Cleaners—Di-Phase—An expanded series of liquid Di-Phase metal cleaners for use in spray and dip cleaning of all types of metals during processing has been announced by the Solventol Chemical Products, Inc., 15841 Second Blvd., Detroit 3, Mich.

Parts cleaned by the Di-Phase method may be stored for weeks, even under high humidity, without rusting, yet can be successfully painted, phosphate coated, etc., without further cleaning. Di-Phase metal cleaning concentrates, baths and processes are covered by U. S. Patents. Unrestricted licenses under these patents are available. For detailed data use Reader Service Card.

E—983. Aluminum Paint Adhesion—Rossaul Company, New York, N. Y., announce their Rossaul No. 57 as a simple, inexpensive phosphoric based material that will remove light oil films and when air dried will create a phosphate coating on the surface of aluminum which acts as a bond for the prime or color coat without penetration of the alumina surface. For additional information use Reader Service Card.

E—984. Solid Plastic Corrosion-Proof Fume Ducts—Heil Process Equipment Corporation, 12901 Elmwood Ave., Cleveland, Ohio, announces the availability of a complete line of solid plastic corrosion-proof fume ducts, hoods and accessory equipment. General construction is offered in polyester glass combinations as well as Rigivin, rigid vinyl type, and Rigidene, polyethylene type.

Rigidon, the glass reinforced polyester resin combination, possesses the strength of light metals and is much lighter in weight. Good acid resistance outside as well as inside reduces maintenance cost and the possibility of mechanical damage. It withstands operating temperatures in excess of 200° F and is easy to install

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because of its light weight construction and simple method of field joints.

Units are standardized in both round and rectangular duct sections and hood designs and manufactured in accordance with the latest recommendations for ventilating open process tanks by the American Standards Association. Available designs, standard sizes, and complete prices may be obtained by using Reader Service Card.

E—905. Reinforcement with Tape Strengthens Abrasive Belt—Where abrasive belts are to be subjected to excessive loads, they may be strengthened quickly and inexpensively with a backing of pressure-sensitive, Fiberglas-reinforced strapping tape. Behr-Manning Corporation, Troy, N. Y., indicates that this simple modification may often permit the use of these belts for fast removal of metal and in finishing operations formerly considered too severe for commercial equipment of this type.

Reinforcement is accomplished by lining the cloth side of the belt with a lamination of the pressure-sensitive tape. In addition to increasing the tensile strength of the backing of the belts, this lamination of Fiberglas filament tape reinforces the belt joint and increases the crosswise rigidity of narrow belts 3/4 inch or less in width. Thus, edge bowing and twisting are eliminated. For additional data use Reader Service Card.

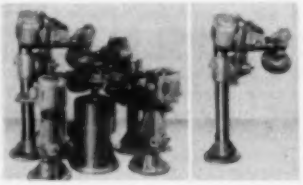
E—906. Wet-Blast Finishing Machine—A new abrasive wet-blast machine for producing refined finishes on production tools is currently available from Abrasive Wet-Blast, Inc., Niles, Ohio.

Special abrasives suspended in water, applied by air pressure, is the operational procedure, and it can be quickly taught to any person on actual processing of parts.

Close tolerances on accurately machined tooling are retained as metal removal is negligible. For additional data use Reader Service Card.

E—907. Versatile Polishing Head—A new polishing head developed especially for fast, accurate and economical deburring of turbine disc-slots has been announced by the Murray Way Corporation, P. O. Box 180, Birmingham, Mich.

Unlike most equipment developed for today's highly technical and specialized uses, this new head may be converted by a few simple adjustments to a wide range of usefulness in any plant. The head may be used with either wheels or buffs and is exceptionally compact in design, making its use in groupings practical with a minimum of floor area. For additional information use Reader Service Card.



E—908. Spray Gun for Fine Work—A new spray gun with ultra sensitive controls for fine spraying has been introduced by the DeVilbiss Company and is available for immediate delivery.

Designated as Type EGA, it is designed for small refinishing jobs, stenciling, blending, high-lighting and decorative work. With a medium sized spray pattern adjustable to practically pin-point size for touch-up work, the new gun is of

DANIELS UTILITY BATCH PLATER

New multiple DANIELS PLATING BARREL unit designed to handle small lots of work economically. Unit consists of a multiple of small size barrels, each independent of the other. Individual removable tanks. Cylinders allow plater a wide range of cleaning, pickling and plating applications.

Send for complete details on this and other plating equipment.

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LOOSE nickel in high acid or low pH baths results from intercrystalline corrosion, which isolates the grains before they have a chance to dissolve. This is practically eliminated in our "Seycast" 99%+ Pure Cast Nickel Anodes. Here the long, narrow grains extend to a common center. (See cross-section below.) As the acid can penetrate but a short distance, the grains tend to remain in place the entire corrosion cycle.

The envelope formed during corrosion is soft, the sludge extremely small per pound of anode, the particles too large to penetrate the bag . . . assuring effective protection against rough plate in high current density baths.

Seymour "Seycast" Nickel Anodes, though designed for Bright Nickel baths, work perfectly in any hot Watts bath having a pH of 4.5 electrometric or lower. Write for further details.

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NICKEL, COPPER, BRASS, BRONZE, ZINC ANODES · BRIGHT NICKEL

Equipment and Supplies

light weight aluminum construction, and can be used with standard glass jar fluid containers of 2, 4, 6 or 16 oz capacity.

The smallest spray gun in the DeVilbiss line, it is, however, designed to withstand rugged usage. For further information use Reader Service Card.

E—909. Liquid Stops Corrosion—The protection of mild steel from corrosion after cleaning is now achieved by the application of Kelite M-2 manufactured by Kelite Products, Inc., 1250 N. Main St., Los Angeles 12.

The product is superior to petroleum oil due to superior corrosion inhibiting properties, eliminates the need for drying prior to treatment, and is impervious to finger-printing. Complete details are available, use Reader Service Card.

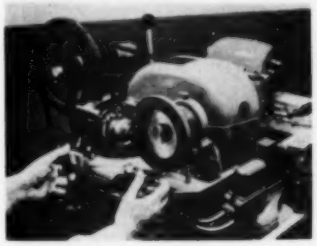
E—990. Polyethylene Graduated Cylinders—Graduated cylinders, fabricated throughout of polyethylene, are now furnished from stock by the American Agile Corporation.

These polyethylene graduated cylinders are extremely light in weight, unbreakable, and are highly resistant to most corrosive chemicals, including hydrofluoric, sulfuric, hydrochloric, and nitric acids at temperatures up to 170° F. They are available in 400 ml and 1000 ml capacity. Literature is available through use of Reader Service Card.

E—991. Steam Cleaning Compound—A free rinsing, readily soluble liquid steam cleaning compound—which is safe on reactive metals and painted surfaces is the most recent development of Turco Products, Inc.

Non-hazardous, non-flammable Turco 3232, is stable, will not settle out, gives scale-free operation, except in the very hardest of water, and emits no disagreeable fumes or objectionable odors. Complete information may be obtained through use of Reader Service Card.

E—992. Abrasion Tester for Cylindrical Parts—Taber Instrument Corporation has announced a new abrasion testing machine for rating the wear resistance



of protective finishes, i. e., black oxidized or electroplated coatings, extruded plastic and enamel applied to air craft, ordnance and metal furniture tubing and other cylindrical parts or test pieces.

The model No. W-3981 tester is fully adjustable to take cylindrical specimens from ½ inch to 6 inches in diameter and 8 inches to 36 inches in length. For further information use Reader Service Card.

E—993. New Interior Coating for Vapor Degreasers—"Circlad" a new interior coating for vapor degreasers, is now announced by Topper Equipment Company, 120 Central Ave., Clark Township (Rahway), N. J.

Up to the present time two types of degreaser construction provided the best type of corrosion protection for the money invested.

Circlad Coating, applied to the walls of zinc coated degreasers has been found to double the normal life expectancy of such degreasers. The new coating is supplied at a very modest additional cost, and is not intended to be a substitute for zinc or stainless clad degreaser walls. For further details use Reader Service Card.

E—994. Pocket Size Metal Hardness Tester—Peabody Industries, Inc., New York, 23, N. Y., demonstrated a pocket size metal hardness tester recently which weighs only 7 ounces, whereas standard equipment now in use weighs hundreds of pounds.

Testing of internal mold and die sections with an area as small as one square inch is now possible. Tests made by one of the leading independent laboratories in

why gamble?
When plating performance and your reputation are in the balance —why gamble on tools?
Today's precision work requires the best in Plating Racks and Fixtures to put the odds in your favor; inferior materials and makeshift methods can no longer be chanced in any plating shop.
Get precision built Naraco Racks —they are individually designed and engineered for your particular job to guarantee the finest results —use Naraco equipment and be sure.
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179-181 Madison Street, Paterson, N. J.
American Rack Co., Inc.
4632 West 21st Place Cicero, Ill.
Imperial Plating Rack Co., Inc.
1613 Industrial Ave., Flint, Mich.
Plant 2, 1008 East Ten Mile Rd., Hazel Park, Mich.
NARACO

Practical Methods for Determining Impurities in Nickel Plating Baths

SILICA can be easily determined by either gravimetric or colorimetric methods.

Colorimetrically, soluble silica is determined by measuring the amount of incident light absorbed by yellow silico-molybdate complex – the reaction product of ammonium molybdate and silicic acid.

The gravimetric method requires that silica be dehydrated with perchloric acid, filtered, ignited and weighed. After being volatilized with hydrofluoric acid and reweighed, difference in weight shows the true amount.

SODIUM and POTASSIUM are revealed by using flame photometry. The diluted bath sample is atomized in the flame photometer. Intensity of the characteristic light of either sodium or potassium is measured with respect to a standard. Concentration of the ion in the diluted sample is read off a calibration curve.

CADMIUM can be determined after copper and iron are removed by precipitation with cupferron and extraction with amyl acetate. Cadmium is precipitated with 2-mercaptobenzothiazole in an ammoniacal solution and extracted with chloroform. Then it is returned to an aqueous medium by shaking the extract with hydrochloric acid. The solution is made strongly alkaline with sodium hydroxide solution and the cadmium is extracted with a carbon tetrachloride solution of dithizone. After dilution, the extinction of the colored system is measured.

ALUMINUM may be determined colorimetrically after removing interfering metals. Color of the aluminon lake is developed by adding aluminon and a buffer to adjust pH to 5.5 and transmittancy of the lake is measured with a colorimeter.

AMMONIUM is separated from the bath by alkali treatment and steam distillation with a micro Kjeldahl apparatus. The ammonia is treated with Nessler's reagent, and the color developed is measured photometrically.

CHROMIUM: To determine chromate chromium, any reducing agents are oxidized with nitric acid. Diphenylcarbazide is added, the transmittancy of the solution is measured, and the amount of CrO_3 present as chromate read off a calibration curve.

For total chromium, any iron, organic compounds, reducing agents, and chlorides are removed, after which the chromium is oxidized with ammonium persulfate. Transmittancy of the solution is measured and the amount of CrO_3 read off a calibration curve.

ZINC is determined colorimetrically. Copper and iron are first removed; then heavy metal impurities including nickel are complexed with sodium di(B-hydroxyethyl)dithiocarbomate. Zinc dithizonate is formed in the presence of these complexes, when a carbon tetrachloride solution of dithizone is added. After removal of excess dithizone, zinc is determined colorimetrically.

CALCIUM is determined by precipitating the heavy metals as hydroxides, and then separating the calcium from the filtrate by precipitating it as the oxalate at a controlled pH. The calcium oxalate is converted to oxalic acid, and the acid is allowed to reduce a known amount of potassium permanganate. Transmittancy of the residual potassium permanganate solution is then measured.

A.E.S. RESEARCH PROGRAM

The American Electroplaters' Society is conducting a comprehensive research program and has developed useful information on current plating problems. International Nickel, in addition to its other support of this program, feels that it will be a further service to make copies of these A.E.S. Research Reports available.

For an authoritative, detailed, 84-page study of this subject, we offer you a free copy of the A.E.S. Research Report, Serial No. 6, entitled *"Determination of Impurities in Electroplating Solutions."* Use the coupon now.

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Naturally we've had imitators. Every good idea has. We're proud that PLA-TANK is the pioneer name in the resin-bonded Fiberglas® tank field and hundreds upon hundreds of our customers are happy with the service they're getting from their PLA-TANK products.

Occasionally some one succumbs to the lure of a lower price or a glossy paint job or a smoother finish and passes up PLA-TANK'S superior features. When they have a failure they condemn plastic tanks as a whole.

Before buying any plastic tank, CHECK THESE PLA-TANK FEATURES

Every unit is made individually by custom layup molding. This personal attention to each square inch of surface is the only way to guard against weakening dry spots and brittle resin buildups.

Translucent material insures against possibility of hidden flaws. Every particle of PLA-TANK is like every other particle — same resistance inside and out, all the way through. No surface coats or paints to cover defects.

Tanks are built to basic hydraulic principles of design. Reinforcing ribs are horisontal to prevent deflection. Corners are built up triple, edges double for added strength and longer service.

Over 150 standard sizes in rectangular and cylindrical tanks are available. Write for size, price and data sheets.

THE Chemical CORPORATION

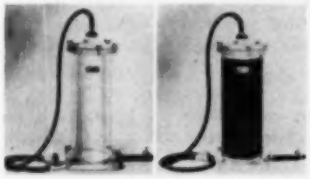
67 Waltham Ave., Springfield 9, Mass.

Equipment and Supplies

the country show the instrument to be as accurate as standard heavy equipment.

The instrument is available in two models, one for steel and the other for use on non-ferrous metal surfaces. For more information use Reader Service Card.

E—995. Low-Cost Ion-Exchange Reactor—Just how much effect the combination of design plus modern material can have is fully illustrated by the "Pup" Reactor for Ion-Exchange as recently developed by Enley Products Company, 254 Pearl St., New York 38, N. Y.



Visually speaking, the "Pup" is a new innovation in plant and laboratory equipment, for it is sturdily constructed throughout of high temperature duPont "Lucite" acrylic resin, and offers excellent chemical resistance plus clarity. Used for ion-exchange, including water demineralization, it is designed to be used individually or in multiples for simple or complex ion-exchange processes. Because of design flexibility the Reactor can be used as a pilot model prior to embarking on full scale production. As a companion to the Reactor, Enley also introduces the "Pup" Regenerator Tube which facilitates easy, fast regeneration by the user.

Reactors are available in two sizes and three heights, and can be used individually or in series, providing a capacity up to 12,000 gallons. For further information use Reader Service Card.

E—996. Steel Tote Boxes—Stewart Parker Company, Pittsburgh 21, Pa., has introduced a new "Custom Built" tote box, designed so that stacking is no longer a problem. Additional information can be obtained by using Reader Service Card.

E—997. Low-Cost Portable Loading Ramp—A portable loading ramp unit that enables one man to perform the work of ten, with push-button control, has just been introduced by the John B. Ilio Engineering Company, 2414 E. 57th St., Los Angeles 58, Calif. This exceptionally low-priced unit is now being widely used—eliminates costly standby time of trucks and men waiting to load or unload.

Portability and adjustability are the two outstanding features of the ramp. It can be installed in 5 minutes at any loading dock and its hydraulically operated dock adjusted to any truck bed height in a few seconds, and is available in two models, manual or electrically powered. For further information use Reader Service Card.

E—998. Fire Protective Transfer Pump—Designed for complete safety from the bottom of the suction tube to the top of the discharge nozzle, the new

Protectoseal Transfer Pump provides effective protection against explosion and fire hazards in the movement of hazardous liquids from receiving drums to use containers.

Three flame arrestors are built into the pump and are an integral part of it. The pump is self-priming and is constructed of special aluminum alloy with a brass telescopic tube for strength, durability, light weight and resistance to corrosion.

Manufactured by Protectoseal Company, 1920 South Western Ave., Chicago 8, Ill., the pump has been tested and approved by Underwriters' Laboratories, Inc., and Associated Factory Mutual Fire Insurance Companies. For further details use Reader Service Card.

E—999. Ultra-Violet Industrial Inspection Equipment—A new Blak-Ray ultra-violet source designed specifically for industrial fluorescent inspection, processing and packing operations, is announced by Ultra-Violet Products, Inc., 145 Pasadena Ave., South Pasadena, Calif.

Fluorescent inspection is proving valuable in the detection of flaws in metal castings and machined parts, and in the determination of complete coverage where transparent or hard-to-see sprays, fillers, and coatings are applied on wood, rubber, plastic, and metal.

The new industrial-type Blak-Ray Model XXX-40 is a dust and vapor-proof fixture that covers an area of 20 to 40 square feet with intense (non-injurious) long wave ultra-violet radiation. Inspection operations can be handled in a normally lighted area. For full information on the technique of fluorescent inspection for your particular application use Reader Service Card.

E—1000. Tough Plastic Disc Traffic Lane Markers—An idea recently introduced in Canada, already taking hold in this country, is the use of three-inch diameter tapered plastic discs to eliminate costly and constant painting of traffic lanes.

The highly visible bright yellow (or white) discs are feather edged, tapering up to a ¼ inch high center . . . thus warning vehicle operators or pedestrians by sight as well as feel.

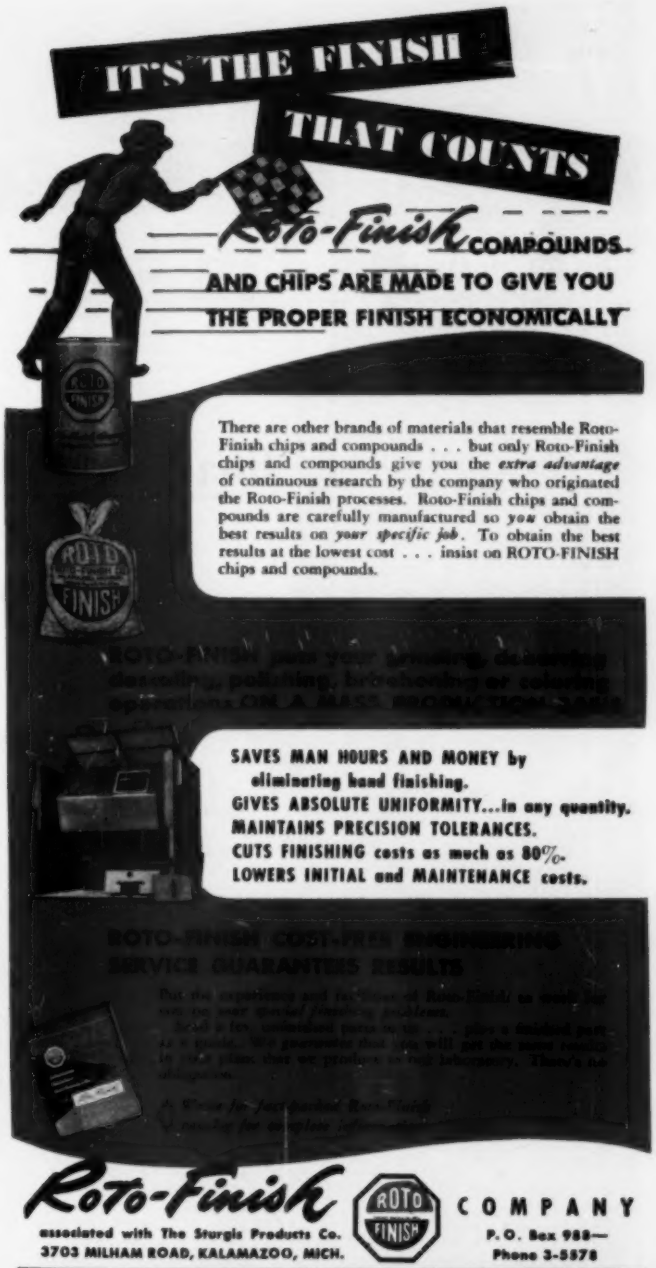
Manufactured by The Campro Sales Company, Industrial Products Division, 1300 Fourth St., S. W., Canton, Ohio, and called Saf-T-Line Markers, the new discs are injection molded of Tenite II. Spaced approximately 24 inches apart, they are easily applied to any floor or road. Their low initial cost, plus their elimination of painting and maintenance of traffic lanes, makes them readily acceptable for industrial use. For additional information use Reader Service Card.

E—1001. Anchoring Assemblies for Pipe, Conduit, Guy Wire—A new pipe bolt and a new eye bolt anchoring assembly have recently been developed by Super-Grip Anchor Bolt Company, Inc., 3333 N. 22nd St., Philadelphia 40, Pa. Both anchoring assemblies provide 50 per cent greater anchorage. The pipe bolt unit is used for mounting conduit, gas, water pipe, etc., to masonry while the eye bolt assembly is used for anchoring guy wires to masonry. For further information use Reader Service Card.

E—1002. Single Face Flat Lapping Machine—This new machine which is equipped with a 60-inch diameter segmental type bonded abrasive lap, provides a superior means for lapping large

parts. It is outstandingly efficient for lapping soft metal parts because it produces a clean, finished surface that is free from grit either embedded or trapped in pores or crevices, and it produces this type of surface in a minimum of time.

An additional advantage is provided by the bonded abrasive lap of this machine. This is the production of bright surfaces that require no subsequent polishing operation. This advantage is pronounced where soft metals must be produced with a bright finish. For additional data use Reader Service Card.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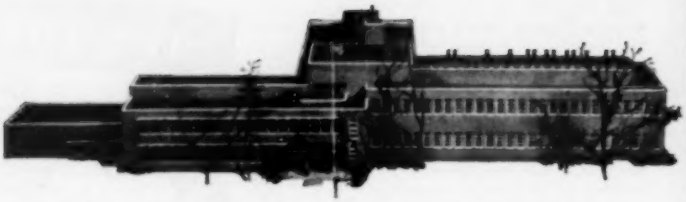

1 *New* WYANDOTTE CHEMICALS research building (above) houses finest facilities in the industry for testing and development of cleaning products and processes for Aviation, Railway and Metal Finishing Industries.

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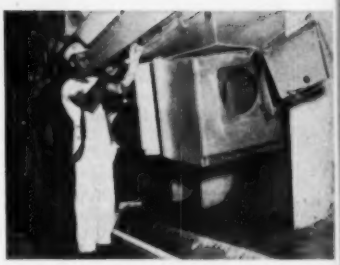
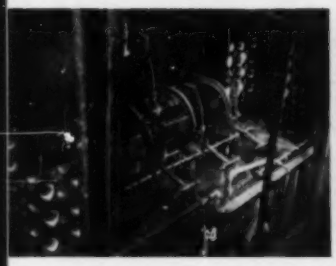


7 ***Spray-booth*** products: Metal Cleaner D, added to water in water-wash booths, coagulates overspray, keeps it from adhering to back wall. Another WYANDOTTE product, Hedral, prevents paint adherence to dry walls. WYANDOTTE Special H strips off paint.



2 ***Fewer rejects***—A parts manufacturer who uses WYANDOTTE F.S.* for electrocleaning of steel parts prior to electroplating, reported fewer rejects due to incomplete cleaning—calls F.S. "thorough and economical to use." You can profit, too, with WYANDOTTE products!

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NOVEMBER, 1952 VOL. 39, NO. 11

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This month's cover photo shows the Henry C. Frick Chemical Laboratory, Princeton University, where the work on Research Project 6 was conducted.

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Editorial

"For the Advancement of the Science of Electroplating"

UNDOUBTEDLY THE GREATEST service the American Electroplaters' Society renders the membership is the dissemination of technical information at the annual convention and in the *Proceedings* which follow, at the branch meetings, and in PLATING. The appetite of the membership for new knowledge of plating and related fields continues to be keen and it is only through the membership itself that this craving may be satisfied, for it is this group which provides the majority of the papers published.

Presently, and until January 15, 1953, papers are being solicited for the Philadelphia Convention by the Editorial Board which will carefully review all those submitted and assist in every way possible to make each paper an outstanding one. The fact that the Board stands ready to help will be of interest to new authors of papers for PLATING as well as to speakers preparing for the 1953 Convention. Younger members of the Society in particular are reminded that the door is not closed, nor have the Educational Sessions been finally set as yet. The seasoned campaigners along with newcomers to the field, both young and old, are urged to take up their pens and in submitting manuscripts do their bit "for the advancement of the science of electroplating."

Don Foulke

Plating as an Aid in the Brazing of Stainless Steel

A. KORBELAK* AND E. C. OKRESS†

Abstract

A method for the use of electrodeposits of nickel to facilitate the manufacture of large-sized intricate designs of stainless steel is described in some detail. The locking of slag lines and voids to obtain a good vacuum tight seal when such parts are used in evacuated electronic devices is indicated. A tabular summary illustrated with photomicrographs is included to outline the use of varying thicknesses of plated coatings for different brazing temperatures.

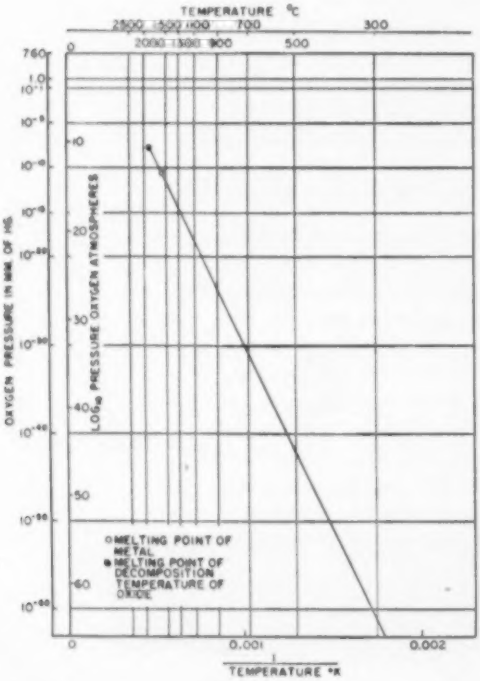


Fig. 1. Dissociation pressure of chromium oxide. Tracing, courtesy Westinghouse Research Laboratories

Introduction

In the manufacture of new equipment called for by the ever-increasing demands of today's designers, frequent use is made of non-magnetic stainless steel alloys such as types 304, 347, etc. In the early design stages of a new electronic tube, the use of such alloys appeared necessary—with the understanding as is true of many new designs, that fabricating problems would occur. The size and complexity of the device was greater than anything previously attempted, and the fabricating problems were even tougher than those expected, because large sizes of various metals including a large glass window had to be assembled together and be vacuum tight up to the softening point of the glass. The large and intricate geometry of the subassemblies of the unit automatically ruled out a straightforward hydrogen furnace brazing operation common with much smaller tubes. So, the large subassemblies of the complicated device had to be assembled by commercial shielded inert gas arc welding techniques.

This feature required prior brazing of 304 and 347 stainless steel lips to the parts of various metals, in order that when corresponding subassemblies were fitted they could be welded together so that the assembly would be vacuum tight.

With conventional vacuum furnace techniques or with commercial hydrogen furnace techniques, the presence of chromium in the metals being brazed together or to copper and other metals posed a serious problem. The normal moisture content in either type of furnace is generally high enough to prevent reduction of very stable chromium oxide which is very undesirable. Good tight vacuum joints are not possible with such a condition, since chromium oxide is removed in vacuum or hydrogen only at temperatures which may be too high for the assembly, as indicated by Figs. 1 and 2, respectively. Through careful moisture control it is entirely possible to braze stainless steel directly in hydrogen (at dew points from −40° C (−40° F) to −60° C (−76° F) but preferably at −80° C (−112° F) or lower if a sufficiently high melting point brazing alloy such as 10 per cent cupronickel is used.) This brazing alloy melts at 1100° C (2012° F)

*Editor, Plating Magazine
†Advisory Engineer, Westinghouse Electric Corporation, Bloomfield, N. J.

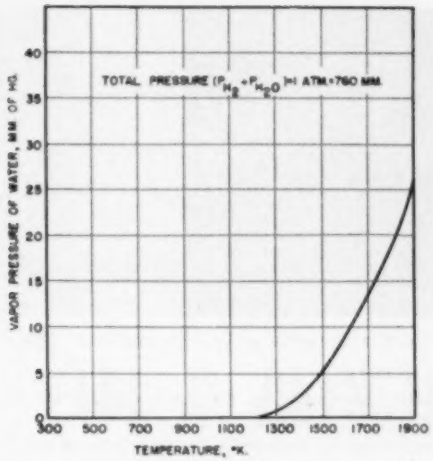


Fig. 2. Partial pressure of H_2O vapor above the equilibrium mixture for the reactions $\frac{1}{2}\ Cr_2O_3\ (s) + \frac{3}{2}\ H_2\ (g) \rightarrow Cr\ (s) + \frac{3}{2}\ H_2O\ (g)$

Tracing courtesy Rand Report R-108

and flows at 1150° C (2102° F) and has the following percentage composition: copper −89.21, nickel −9.68, iron −0.80, balance zinc, manganese and lead. Obviously, the direct method cannot be used if a lower melting point alloy such as copper is being joined to the stainless steel with say silver-copper eutectic alloy, unless very low dew points of the order of −150° C (−238° F) are maintained. Doing such a job on a commercial scale consistently is too costly and impractical. It was found very satisfactory to use a plated coating of nickel on the steel in this type of a brazing problem which was encountered in the electronic device described above. Lower brazing temperatures with considerably higher dew points, an economic consideration of importance, produced consistently good vacuum seals simply through the observation of certain values of non-porous deposit thicknesses. The sintering of the plated layer prior to actual brazing

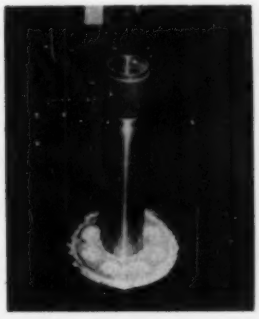


Fig. 4. Photo of assembly represented by Fig. 3

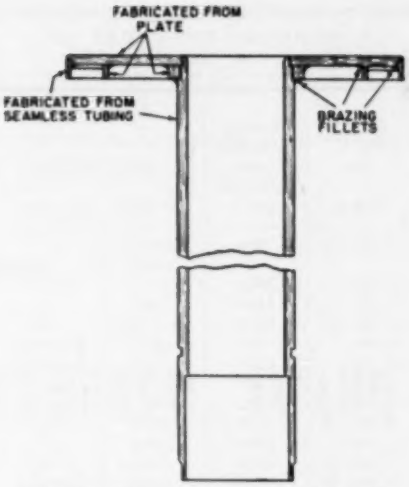


Fig. 3. Cross section of a typical subassembly illustrating slag and void locking technique by brazing

steps was found to be advantageous and imperative in some brazing operations. Through the use of this step, the added problem of slag lines and voids encountered even in the best of selected lots of stainless alloy stock was effectively overcome by the adoption of a slag locking technique as shown in Fig. 3. The shaded lines in the figure indicate slag line direction, with the dark areas representing brazing alloy fillets. Figs. 4 and 5 are photos of an actual simple subassembly prepared by the outlined techniques. Fig. 6 is a cross section of a typical brazed joint, between nickel plated 304 steel and O.F.H.C. copper, at 1000 magnifications with the dark layer of gold brazing alloy over the light area of sintered nickel plate. The alloyed portion of electroplated nickel is adjacent to the gray 304 stainless steel.

Procedure for Plating

The stainless steel alloy parts were first cleaned to remove surface and sub-surface contaminants. In the case of spinnings contamination was found to extend beneath the surface and was removed by an electrolytic etch in 1–1 sulfuric acid used at room temperature with the stainless parts being made anodic. Treatment time varied with the condition of the part and averaged about two minutes.

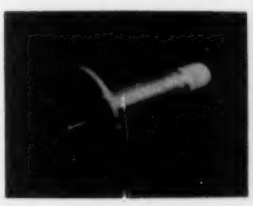


Fig. 5. Same apparatus as Fig. 4

TABLE I. PLATING THICKNESS VERSUS BRAZING TEMPERATURES AND TIME AT +25°C DEW POINT.

Nickel Thickness inches	Heating Temperature ° Centigrade	Condition After 30 min	Condition After 60 min
0.00025	900	unsatisfactory	——
0.00025	1000	poor	——
0.00025	1100	bad	——
0.00025	1200	very bad	——
0.0005	900	good	doubtful
0.0005	1000	good	doubtful
0.0005	1100	doubtful	poor
0.0005	1200	poor	bad
0.00075	900	good	good
0.00075	1000	good	good
0.00075	1100	good	good
0.00075	1200	good	doubtful
0.001	900	good	good
0.001	1000	very good	good
0.001	1100	good	good
0.001	1200	good	good

TABLE II. BRAZING TIMES AND TEMPERATURES AT −60°C DEW POINT.

Firing time in minutes	Temperature ° C	Temperature ° F	Remarks
5	900	1652	Insufficient alloying. May expect vacuum leakage along nickel-steel interface.
20	900	1652	Perceptible alloying. Considered a lower limit.
5	1000	1832	Insufficient alloying.
30	1000	1832	Adequate alloying. Recommended for vacuum work.
5	1116 to 1171	2041 to 2140	Rapid alloying. No vacuum leakage expected. Considered an upper limit.

ig. 6. Cross section of typical brazed joint. 1000X

After electropickling, the parts were rinsed thoroughly in clean water. A follow-up treatment in a Wood nickel chloride strike bath for between one and two minutes, a water rinse and final transfer to a modified Watts nickel solution completed the plating cycle.

The chloride strike was found to cause trouble unless purified free of copper and iron. Purification was simple with a low current density electrolysis, high surface area cathode method. Agitation during electropurification was helpful in speeding up the operation, which was performed periodically. Heavy copper contamination was found to result in thick spongy copper formation during purification and required frequent removal to prevent its sloughing off with resultant re-contamination. Anodes of graphite and/or nickel were bagged with a material of a special synthetic fiber.

The purified Watts nickel solution used was one containing approximately ten ounces of metal. Pitting control was exercised through the use of regular additions of a specially stabilized grade of hydrogen peroxide, on the recommendation that the use of peroxide stabilized with organics such as acetanilide be avoided. Current densities in the neighborhood of 25 amp/ft² (2.6 amp/dm²) were used. Thin spots such as would occur at contact points were overcome by shifting contacts when half the desired final thickness of plate was obtained. Care was observed in handling of the work during this phase of the plating operations, with operators wearing clean gloves and handling the work under water.

For ordinary brazed joints where short brazing times were encountered it was found adequate to plate less metal to obtain a satisfactory job. Thicker coatings, approaching an average of 0.002 inch gave an extra margin of safety where long brazing times were encountered or when highly recessed work was processed. Table I summarizes the nickel coating thickness tested, in commercial hydrogen furnaces with dew points of the order of +25° C (+77° F).

Metallurgical studies showed that the nickel deposit began to alloy above 900° C and that it continued with time.

(*Continued on page 1228*)

The following article is a text of the address presented by Mr. James Zeder at the Chicago Convention of the American Electroplaters' Society. In view of the impact of Mr. Heussner in the affairs of the Society and the importance of the award named after him, the address is reproduced in full.

Presentation Address

CARL E. HEUSSNER MEMORIAL AWARD

JAMES C. ZEDER*

Mr. Chairman; ladies and gentlemen of the American Electroplaters' Society; and guests:

When I learned that the American Electroplaters' Society had established an annual award in the memory of Carl E. Heussner, I was moved and grateful. My feelings were not only those of one who, like so many of you here, remembers with respect the ability and work of a distinguished chemist, but also of one who counts himself fortunate to have enjoyed his friendship.

I am grateful to the Society, and to Mr. Glenn Friedt who has endowed the award, because, in establishing the Carl E. Heussner Memorial Award, they express a kind of appreciation too little shown these days. It may be that all of us, understandably perhaps, in the bustle of modern life, tend to take for granted the countless blessings we enjoy because of the genius and the hard work of those who make such blessings possible.

The life of Americans is rich. We enjoy many comforts, aids, and safeguards for better living. Ours is the highest material standard of living in the world. This life is the sum of uncounted millions of efforts, great and small. They have been made by individuals or by groups of people, working always to do things better, to make things finer, to add to the sum of better living, which is our American way.

Of course, we cannot fully recognize each of these efforts. But the works of some men are of such importance that we would be remiss if we took silently and for granted the things they have done for the betterment of our lives. I have often noted, in travelling about the country, a memorial here or a plaque there commemorating some minor historical incident or an effort by one of our ancestors. Perhaps a small military action is memorialized; possibly the works of an early pioneer are recalled. It is right and proper that this be so. We should remember those who built our great country. Indeed, we probably could do a great deal more than we do to strengthen awareness of our heritage.

But when we turn to the works of Americans who labored for the betterment of their fellowmen in fields outside the political or the military, or the spiritual, there seems to be a tendency to forget. I would not want to set myself up as a judge of the relative values of the contributions men have made for the good of us all. After all, each work that is for the benefit of men is worthy of our gratitude and respect. But I would suggest that there are Americans whose truly great contributions in behalf of their people are too quickly forgotten.

We have paid fitting honor to military achievement, but how many men of medicine are properly remembered? Is the genius and labor that gives future generations hope for greater health and longer, more useful life less worthy of our recollection? We take proper note of political accomplishment. But shall we accept in passing the achievement of the scientist or the technician who devised a tool that made a great political or military objective possible?

If it rested with men like Carl Heussner themselves, their works would move into the public realm and they, for their part, would find all the reward they

*Vice-President, Director of Engineering and Research, Chrysler Corporation

sought in their accomplishments alone. Your Society is not content to let the great work of Carl Heussner stand without your recognition. Through the Carl E. Heussner Memorial Award, you have given a tangible and worthy form to your expression of appreciation.

I spoke of the scientist who may, through his effort, place great tools of accomplishment in the hands of the military or political leaders. Sometimes those tools are vital to reaching a military or political end. There is no stronger example than that of the atomic bomb, a vast attainment, scientifically, with political and military meaning we have not yet fathomed. Yet, as Mr. K. T. Keller has often pointed out, had it not been for Carl Heussner, the atomic bomb project might not have been accomplished when it was.

Carl Heussner came into the picture when it was learned that the government scientists were specifying solid nickel or nickel-clad steel diffusers in a gaseous diffusion process connected with the bomb project. Apparently it did not upset the project scientists that to make such devices of solid nickel would have taken all the nickel mined throughout the world by the International Nickel Company for two years.

I remember sitting in the meeting when Carl Heussner declared that the job could be done by electroplating nickel directly on steel. His plan would require only four per cent as much nickel as nickel-clad steel or only about one-hundredth as much as solid nickel.

I also remember that the experts told Carl his plating idea just wouldn't work. Carl thought otherwise and he knew that he would have to prove his claim.

The next time I saw Carl was in our Highland Park Plant. There he stood in a plating pit, clad in a black raincoat, sou'wester and boots, sweat pouring down his face, as he prepared to nickel-plate boiler plate to prove his point. Carl's plating worked. In fact, it worked better, because he knew, as every plater knows, that in electro-plating purer nickel is deposited than can be obtained in commercial forms of so-called pure nickel.

This tremendous contribution was not as easily done as relating it might seem. It took knowledge, faith, determination, and practical comprehension to put it across. Time will tell what nuclear fission will mean to the world's history. But Carl Heussner's contribution to making the atomic bomb possible in the time it was achieved is a matter for no debate.

This is an example of a specific contribution he made to an undertaking. It was one of many instances in which Carl Heussner was able to produce a solution to a big problem by combining his scientific background with his broad, practical knowledge.

That was the sort of scientist he was. A perfectionist, but broad-gauge in his outlook and application. A scholar, but a worker who applied theory to practice.

Electro-plating was his great interest. I think it can be said that few men did more than Carl Heussner to change plating from an individual art to a science. Carl Heussner was one of those chemists who wanted to help bring plating to the high standards it now enjoys. He had the scientific background, he had the academic degrees running up to his Ph.D., but he also acquired for himself a practical knowledge of plating. When he talked plating, he talked platers' language. But behind what he said was also the thinking of a great chemist.

In ten years, between 1930 and 1940, his persistence made changes in plating standards and adherence to quality that was recognized in our industry. His achievement was a clear example of what can be done when a scientist is willing and able to roll up his sleeves and find out the practical side of a problem.

Carl Heussner never was content only with his immediate undertakings, however great many of them were. He was also a guiding spirit in his profession. You all know of the important work he did following the war in reorganizing the work of the American Electroplaters' Society Research Committee. Moreover, he was active in the American Society for Testing Materials, the Detroit Engineering Society, the American Ceramic Society, the Electrodepositors' Technical Society, and many others. He was a member of 17 committees of the Society of Automotive Engineers alone.

I have talked about Carl Heussner, the scientist with rolled-up sleeves. And that is not just a figure of speech, as you know. As a matter of fact, when Carl was really in the midst of a problem he fairly bristled. The last thing he cared about was how he looked or what else happened, so complete was his concentration. In that intense, fine mind of his, all was order and precision. When someone talks about a dedicated scientist, I think of Carl Heussner.

His last years were difficult ones. We who worked with him tried very hard to slow him down; to husband his weakening resources. There were many times in those years when he kept going by will power alone. While his mind grappled with the problems he sought to solve, his spirit fought the inroads of his illness. He was determined, to the end, to keep going. And he did.

As I look back, I can recall few men whose opinions and decisions carried such tremendous weight. This was true in all levels of the Chrysler Corporation. It was true in industry and professional groups outside, where Carl's counsel was constantly sought. This tremendous prestige and respect was fully earned.

When Carl Heussner was asked a question at a meeting, for example, he never gave a general sort of answer. He replied so clearly, so specifically, so completely, that there was no debate when he finished; there were seldom even questions to be asked. When Carl had a course of action to recommend in our company, he didn't have to sell his idea first. All he had

(Continued on page 1228)

We are fortunate in being able to present the following review of papers presented at the recent International Conference at Dusseldorf, Germany attended by the author. Other Americans at the sessions were Mr. Carlson, Erie, Pa., representing the American Hot Dip Galvanizers Association, and Mr. Pearson of the Clifton Conduit Company, Baltimore.

INTERNATIONAL CONFERENCE ON HOT DIP GALVANIZING

ALLEN T. BALDWIN

AN INTERNATIONAL Conference on Hot Dip Galvanizing was held at Dusseldorf, in Germany, from June 30 through July 4, 1952, which was attended by 180 delegates coming from Austria, Belgium, Denmark, France, Germany, Great Britain (including Northern Ireland and Eire), Holland, Italy, Norway, Sweden, Switzerland and the United States. This Conference was the second such meeting held by this group, the first having taken place in Copenhagen in 1950. During the course of the Conference fourteen papers were presented and discussed extensively. In addition, the members had the privilege of visiting seven plants, one of which was a zinc smelter and the others were actively engaged in galvanizing tubes, structural steel and jobbing operations, wire and hollow ware and tanks. Several of the plants showed very recent construction or reconstruction and therefore were of much interest to those attending the Conference. The papers dealt with matters affecting the quality of the hot dip coating and numerous phases of the construction and operation of the galvanizing shops themselves, including working conditions. The Zinc Development Association of Britain has taken the leading part in organizing these Conferences and carrying the burden of actual conduct of the meetings themselves in a very efficient and effective manner. The German Hot Dip Galvanizers Committee and Zinkberatung (Zinc Council) of Germany, made the arrangements for the local meetings and visits in and around Dusseldorf, which included visits for the ladies attending the Conference to points of interest to them. The Conference was ended by an excursion participated in by practically all members to Cologne and a boat ride along the Rhine.

The program opened with a series of three papers bearing on the conditions of the hot zinc coating which contributed to its ductility and to its adherence to the basis metal. These features are of outstanding importance to the galvanizers of sheet or strip steel.

In *The Ductility of Hot Dip Galvanized Coatings*, H. Bablik, Lecturer, Technical University, Vienna, is particularly concerned with the deep drawing characteristics of galvanized sheet steel which behaves as a compound body with an iron base and layers of zinc and zinc iron alloy. Tensile tests showed that the degree of possible crack-free deformation depended on the crystal orientation, cracks occurring in those crystals which are so oriented to the direction of the load that the normal stress in the plane of cleavage is exceeded. Since the deforming of the zinc layer results from the deforming of the iron base, experiments were conducted to measure the adhesion of the zinc to the iron base which showed that this adhesion is somewhat less in the presence of an iron zinc alloy layer than in its absence.

The Flaking of Hot Dipped Zinc Coatings, by M. L. Hughes, British Iron & Steel Research Association, discusses one of the results of unsatisfactory adhesion, namely, flaking or peeling. This author presented evidence to support his conclusion that flaking of itself could only occur when there was a three layer system, namely, the basis steel sheet, an alloy layer and the pure zinc layer. In the absence of this three layer system, cracking only might occur on distortion of the sheet. Flakes are said to consist of the pure zinc layer and alloy only. Under these circumstances any increase in the adhesion of the alloy layer to the basis steel would reduce the tendency to flaking. In general, freedom from flaking on sheets when being formed requires the creation of thinner total coating thicknesses.

The Effect of Aluminum and Iron on the Structure of Galvanized Coatings, by M. A. Haughton, British Non-Ferrous Metals Research Association, deals with one method of obtaining coatings of good adherence and freedom from flaking. Modern hot galvanizing methods for various reasons have led to the use of aluminum in the molten zinc baths in the order of 0.2 per cent or less, with the result that the alloy layers are very thin. Since the operation of galvanizing baths containing these quantities of aluminum have seemed to produce coatings of various types, this paper deals with the effect of iron dissolved in the zinc along with aluminum in an effort to explain some of the inconsistencies observed by others. Studies were made by using mixtures of zinc, iron and aluminum of quantities encountered in practice and melted in a graphite pot where the temperature was maintained at 450° C ± 7° C (842° F ± 13° F). The effect of dipping time, as well as variations in the iron and aluminum con-

tent, were observed metallographically and by weight loss. Part of the conclusions are that varying the iron content of a bath containing zinc only had no observable effect upon the metallographical structure of the coating or upon the rate of attack on the steel in the bath. The same conclusion applies to baths containing 0.05 per cent aluminum and various amounts of iron. In this case, the outer surface, however, is smoother and brighter. The addition of 0.1 per cent aluminum profoundly modifies the structure of the coating and the rate of attack on steel. With low iron content baths there is very little, if any, alloy layer. As the iron content rises there is an increasing tendency toward heavier attack of the steel and to the development of loose alloy layers. In baths saturated with iron the attack is of the rapid type. The addition of 0.2 per cent aluminum gives similar results but the protective film is thicker. The whole picture suggests a critical unstable state where a slight change in conditions may completely reverse the effect of aluminum additions.

Observations on the Attack of Molten Zinc on Iron by Dr. R. Haarmann, Rheinische Rohrenwerke. He reports experiences with the attack of molten zinc on steel, with particular reference to what takes place in the steel kettle holding the molten zinc. This paper is intended to publish observations on interesting experiences that generally have led to unsatisfactory service life of the steel container. He discusses the effect of temperature, irregular heat application and the composition of the steel from which the kettle has been made, as well as the composition of the zinc bath itself. The attack on the kettle structure may be such as to cause large flakes to form and separate from the basis metal or pits may appear of various types. One factor of some importance in this field is the attack of the molten zinc on the grain boundaries of the steel, as well as the direct dissolving of the steel itself. The paper is accompanied by extensive micrographs and other data bearing on this problem.

The Potential Behaviour of the Iron-Zinc Alloy Layer of Galvanized Steel in Various Hot Aqueous Solutions by R. C. Weast, Department of Chemistry and Chemical Engineering, Case Institute of Technology, Cleveland, Ohio. This paper is a report of studies carried out in the laboratories of the Case Institute of Technology, in Cleveland, Ohio, on the conditions influencing corrosion of the hot galvanized coating. The studies include the potential behaviour of the zinc-iron alloy to observe if those factors known to influence the potential behaviour of zinc have a corresponding effect on the alloy layer. The effect on the alloy layer is complicated by many factors including the variation of zinc and alloy potential with solution composition, differential aeration cell effects, and relative corrosion and pitting effects. This study led to the following conclusions:

(1) The alloy layer of galvanized steel is cathodic to steel and zinc in a variety of waters whose chemical composition falls within the range of those commonly encountered in domestic supplies.
(2) The potential of the alloy becomes more cathodic as the temperature of the water is increased from 20° to 70° C (68° to 158° F).
(3) Solutions which cause the potential of zinc to become more cathodic with respect to iron also cause the potential of the alloy layer to behave in a like manner.
(4) The alloy potential becomes more anodic as the dissolved oxygen concentration in the water is reduced below the saturation value.
(5) Low concentrations of elements such as lead, tin, aluminum, and cadmium commonly found in commercial zinc do not make the resultant galvanized object as cathodic as does the iron-zinc alloy formed during normal galvanizing.
(6) The alloy potential is apparently sensitive to minor changes in the concentration of the corroding solution.

A Galvanizer's Views on Bath Heating and Operation by E. McI. Wilson, Henry Hope and Sons, Ltd., England, was the first of a group of papers dealing with operations and equipment. Mr. Wilson presents a very complete picture of the factors involved in the selection and operation of the galvanizing kettle. This major piece of equipment is probably the most costly single piece and the place where there are great opportunities for inefficiencies to develop in the operation of the plants. He discusses the types of fuel, the methods of applying the heat, giving specific data on BTU requirements for various conditions of operation. This paper should be of practical value not only to those seeking to enter the field but to those who already have shops of their own. An illustration of the care the author has taken to develop the important details is his illustration of the fact that a given plant if operated on a 3-shift 5-day week will only use 55 per cent of the amount of heat per ton galvanized that the same installation would use if operated with a single shift for 5 days. A study of the proper hours of use of the installation is shown to be most important. Likewise, he goes into detail to show the effect of changing dimensions of the kettle so that the perimeter of the surface area is kept as low as possible, to secure economy in use of fuel.

Top Heated Galvanizing Bath at Virsbo, Sweden by N. Thoren, Engineer, Wirsbo Bruk Akt., Virsbo, is the story of a special installation which has been operating successfully in Virsbo, Sweden, for over two years. This installation consists of a container built of firebrick and has no steel walls coming in contact with the molten zinc. The heat is supplied by direct radiation from electrical resistors mounted over part of the top surface of the bath. This method of construction eliminates the question of burning holes through the steel bath walls with resultant losses, and eliminates the creation of dross by attack of the zinc on the steel container and provides a simple and trouble-free method of re-heating the zinc bath after there have

been idle periods when the metal has been allowed to freeze. There are size limitations that are determined partly by the energy that can be radiated per square foot of the zinc surface. This development provides an attractive method of establishing a zinc bath for many uses. The heat requirement for actual operation of the kettle will vary from as low as 50 KW per ton to 100 KW per ton, depending in part on the relation of weight to surface of objects being galvanized.

The Galvanizing of Cast Iron by W. Montgomery, F. Braby & Co., Ltd., Glasgow, discusses the handling of an important line of products which galvanizers are called upon to galvanize. The problems in this field have to do with the creation of suitable zinc coatings that are smooth and adherent, and to have a low dross formation. The industry experience in this field is one of constant attention to the formation of dross which is higher in relation to the work done with steel objects. It is pointed out that the microconstituents of the casting which can influence the galvanizing action are graphite, carbide and silicoferrite. The writer concludes that silico-ferrite reacts more vigorously with zinc than pure ferrite. He concludes that only two procedures can be recommended of practical value to the general galvanizer. Shot blasting as a preparatory treatment gives the best results but this must be followed by a short acid dip and then the casting should be passed through a suitable flux blanket. The other recommended method is to follow an acid pickling with washing and dipping in a flux bath and there is an indication that a combination of these two recommended methods produces the best results, whether dealing with grey castings or malleable castings.

Flux Techniques and Hot Galvanizing Economies by A. T. Baldwin, Hanson-Van Winkle-Munning Company, U. S. A., is a resume of experiences gained with the use of the No. 20 zinc ammonium chloride type of flux in the United States during the past twenty years, showing that the processes developed with the use of this material in preparing work to be galvanized have been definite contributors to improvement in quality and lowering of costs in many fields.

Working Conditions in Job Galvanizing Plants by H. T. Eatwell is a report covering the steps that G. A. Harvey & Co., Ltd., of London, have taken in the creation of modern working conditions in their shops in that city. The article deals with floor construction, lighting, ventilation, heating, mechanical handling, galvanizing and pickling baths, and those facilities which provide comfort and health to the workers, such as washing facilities, etc. As a consequence, this article would be very important to those contemplating entering this field of manufacture.

The Economics of Galvanizing by F. C. Braby, F. Braby & Co., Ltd., is a discussion of the place materials, heating, labor, overhead, administrative and selling expense, enter into the cost of the hot galvanizing operation in England. This, of necessity, not only considers the costs of the materials but the ways in which to control losses and to salvage values from by-products. It would appear that the cost of the zinc itself lies between 50 per cent and 70 per cent of the total cost, while acids vary from 1 per cent to 8 per cent, flux about 1 per cent, heating about 5 per cent, and labor varies from 6 per cent to 25 per cent.

Some Notes on the Recovery of Zinc from Galvanizers' Ash by N. B. Rutherford, British Non-Ferrous Metals Research Association, reviews various methods of separating the granules of metallic zinc, which generally occur in the zinc ashes removed from the hot metal during the course of operation in the shop. About 60 per cent of the zinc melted leaves the shops in Great Britain as coating on the work and the balance of the zinc melted is converted to ash or dross and some of this zinc can be recovered in a suitable metallic form for further use. This brings up the question of the cost of recovery and this paper discusses the various methods that have been in use by galvanizers and leads to a recommendation of the use of a steel cylinder with an open bottom suspended in a remote corner of the galvanizing kettle. The ashes, as accumulated, are placed in this cylinder and are stirred into the surface of the molten zinc. This method recovers about 80 per cent of the metallic zinc present, with a minimum use of labor. This degree of recovery is only exceeded by the expenditure of a great deal more labor by other methods.

The Treatment of Pickle Liquors by A. R. L. Chivers, Zinc Development Association, Britain, discusses the composition of waste pickle liquors and methods of recovery. In the case of hydrochloric acid, which is used very broadly in England and on the Continent, there seems to be little to do other than neutralize to create a solution which can safely be discarded into a sewer or river. There are only limited possibilities of by-product recovery. With sulphuric acid, however, which is being used in galvanizing shops working on single products, such as sheets or tubes, recovery systems dealing with salvaging ferrous sulphate and returning the purified acid to the pickle system, are being used successfully. Illustrations of equipment for this purpose are given along with statistics of operation so that this subject matter should be of interest in connection with stream pollution problems in this country.

Trends in Hot Dip Galvanizing by R. W. Bailey, Zinc Development Association, Britain, is in part a summary of the impressions gained by the O. E. E. C. Galvanizing Mission No. 78 of European galvanizers in the United States in the Fall of 1951. The papers presented at this Conference also disclose the trends in all fields of galvanizing. He points out that the United Kingdom and European galvanizing industries are compelled to make themselves efficient and competitive and, from the writer's experience, this conclusion is in line with the facts, particularly as was demonstrated by the broad interest displayed by the members of the Conference in all the activities of the Conference.

Heussner Award

(*Continued from page 1224*)

to do was state it. We accepted it as law. That was because Carl Heussner had proved, time after time, that he didn't speak unless he knew what he was talking about. He was a man of complete integrity, personally and professionally.

And there was another, wonderful side to this man. It was his great heart and his kindness. He was deeply devoted to his church. All his life he and his wife set aside ten per cent of his earnings for his church. They both had a deep affection for children, but were not destined to have their own. So they translated their love for children into help for unfortunate youngsters. Quietly they "adopted" many needy families and war orphans in Europe after the war. Every week packages of food and clothing went from the Heussners to help bring a little comfort and reassurance to innocent victims of war.

Carl Heussner also helped a number of youngsters through school. We know that he helped some all the way through college. But we were never able to pry details about such generosity from this modest, kindly man.

At such holiday times as Thanksgiving and Christmas there were strange but welcome faces at the Heussner table. Carl always went downtown and found a needy person or two. He would bring them home to share the holiday feast.

We also noticed that almost always there was someone, often more than one person, living in the Heussner household. They were not relatives; they paid neither rent nor fee; they were just people in need. The Heussners took them in.

During the war Carl Heussner worked day and night, driving himself without mercy. His good wife was not content to sit at home, nor even to do the usual kind of work for a person in her station. Instead, she went to work in a factory, running a machine. And she worked the night shift. Every cent she received, she turned over to charity.

This was Carl Heussner and his wife.

Even if I had a great deal more time to speak than I have, I could only begin to cite all the accomplishments of Carl Heussner. I could never reflect his great spirit in mere words. But this audience is well aware of Carl Heussner's qualities and achievements. That is why you, of the American Electroplaters' Society, have honored his memory and works by establishing the Carl E. Heussner Memorial Award. And this is why Mr. Friedl endowed the memorial.

As a friend, associate, and admirer of Carl Heussner, I want to thank the American Electroplaters' Society for the privilege of participating in this meeting. And I want also to thank the Society for what they have done in extending recognition to the works and the memory of a gentleman, a scientist, and an American, in the best meanings of those words.

Brazing of Stainless Steel

(*Continued from page 1222*)

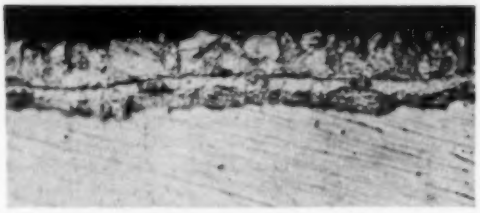


Fig. 7. Photomicrograph of sintered nickel electrodeposit on 347 stainless steel. 1000X

From the foregoing data .001 inch (and preferably .002 inch thick) nickel plating is recommended on 304 and 347 steel when sintered in commercial hydrogen furnaces with dew points of the order of +25° C for 30 minutes at 1000° C, provided the nickel plating is non-porous to begin with and the subsequent brazing temperature is below 1000° C for 30 minutes' duration.

As an added protection against interface leakage in high vacuum work (.002 inch) coatings were heated in a −60° C dew point hydrogen furnace. Representative results are summarized in Table II.

Fig. 7 is a photomicrograph of a specimen with .002 inch nickel sintered to 347 steel at 1000° C (1832° F) for 30 minutes, in a −60° C dew point hydrogen furnace. This was a practice adopted to allow for more uniform alloying and is the recommended procedure for subsequent brazing at temperatures below 1000° C for 30 minutes' duration. At 1116° C and up to 1171° C the alloying is quite rapid so that if a large plated mass is being brazed or heat treated to alloy the deposit to the steel, localized fusion may occur in those areas which come up to temperature immediately.

Through the use of the plating cycle outlined it was possible to put into production, the joining of large stainless alloy parts through simple commercial hydrogen brazing techniques with nominal or usual dew points of the order of +25° C, and employing brazing alloys such as silver-copper eutectic, silfos, gold-copper, etc.

The following references contain much specialized and valuable information on joint design, brazing and electroplating which is of a supplemental nature to the foregoing paper: S. Dushman, Scientific Foundations of Vacuum Technique, John Wiley & Sons, Inc., New York (1949). W. H. Kohl, Materials Technology for Electron Tubes, Reinhold Publishing Corporation, New York (1951).

Acknowledgment

Acknowledgment is hereby made to L. C. Werner, J. Corcoran, H. J. Ehringer, A. Baldi and R. Green for their contributions in the preparation of data for the foregoing paper.

Physical Properties of Electrodeposited Metals

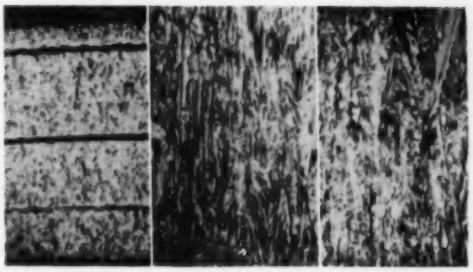
I. NICKEL

3. The Effect of Plating Variables on the Structure and Properties of Electrodeposited Nickel

A Correction

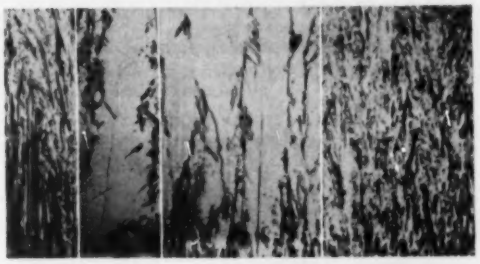
PLATING *regrets the errors in figure captions that occurred in the publication of the A. E. S. Research Report in the August issue, and accordingly, publishes the following figures with the correct captions. The following Fig. 38 is also published to correspond to the printed text. These corrections are arranged on backing pages so they may be detached and inserted in the August magazine.*

Figure 8—Top Row



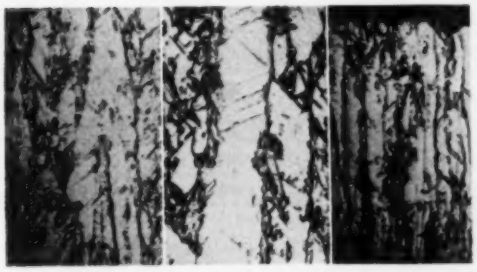
0.25 amp/dm² (2.3 amp/ft²) (A) | *0.5 amp/dm² (4.6 amp/ft²) (B)* | *1 amp/dm² (9.3 amp/ft²) (C)*

Figure 8—Bottom Row



20 amp/dm² (186 amp/ft²) (G) | *25 amp/dm² (230 amp/ft²) (H)* | *50 amp/dm² (460 amp/ft²) (I)*

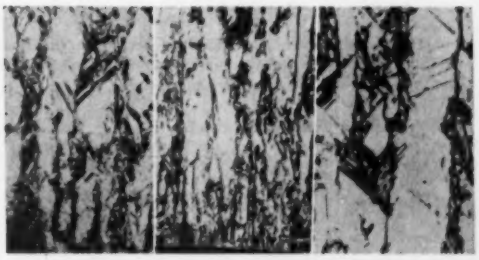
Figure 8—Center Row



2 amp/dm² (19 amp/ft²) (D) | *5 amp/dm² (46 amp/ft²) (E)* | *10 amp/dm² (93 amp/ft²) (F)*

Fig. 8. Effect of current density on the structure of nickel deposited from the $S_{III}C_l$ bath at 55° C (131° F), and a pH of 3.0. Cross section x 250. Etchant: glacial acetic and nitric acid

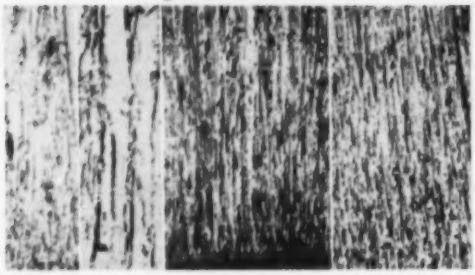
Figure 9—Top Row



(A) pH 1.0 | *(B) pH 1.5* | *(C) pH 3.0*

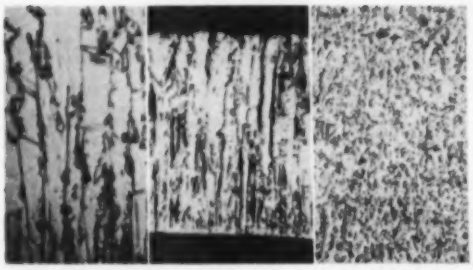
Fig. 9. Effect of the pH of the plating bath on the structure of nickel deposited from the $S_{III}C_l$ bath at 5 amp/dm² (46 amp/ft²) and 55° C (131° F). Cross section x 250. Etchant: glacial acetic and nitric acid

Figure 9—Bottom Row



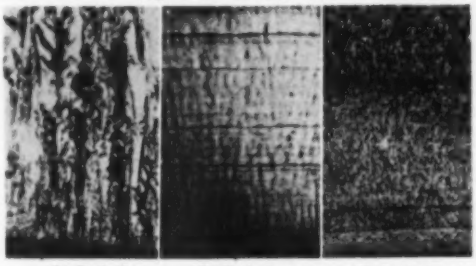
(D) pH 4.6 *(E) pH 5.0* *(F) pH 5.5* *(G) pH 5.7*

Figure 11—Top Row



(A) Bath Na at pH 3.0 *(B) Bath NH_4 at pH 3.0* *(C) Bath NH_4 at pH 5.0*

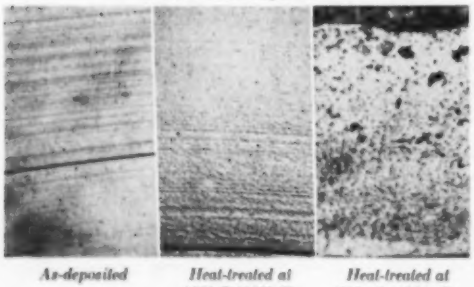
Figure 11—Bottom Row



(D) Bath F at pH 3.0 *(E) Bath Am at pH 8.5* *(F) Bath Ac at pH 4.5*

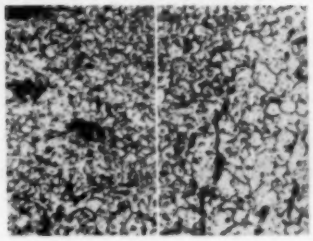
Fig. 11. Nickel deposited from different types of baths at 55° C (131° F) and 5 amp/dm² (46 amp/ft²). Cross section x 250. Etchant: glacial acetic and nitric acid

Figure 61—Top Row



As-deposited *Heat-treated at 400° C (752° F)* *Heat-treated at 600° C (1112° F)*

Fig. 61—Bottom Row



Heat-treated at 800° C (1472° F) *Heat-treated at 1000° C (1832° F)*

Fig. 61. Effect of heat-treatment on structure of bright nickel deposit, a, produced at 4.3 amp/dm² (40 amp/ft²). Cross sections x 250. Etchant: glacial acetic and nitric acid

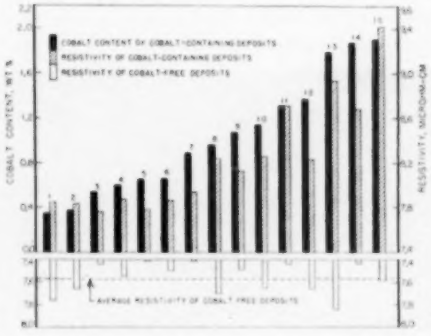

COBALT CONTENT OF COBALT-CONTAINING DEPOSITS
RESISTIVITY OF COBALT-CONTAINING DEPOSITS
RESISTIVITY OF COBALT-FREE DEPOSITS
COBALT CONTENT, WT %
RESISTIVITY, MICROHM-CM
AVERAGE RESISTIVITY OF COBALT-FREE DEPOSITS

Fig. 38. Relation of resistivities of 15 nickel deposits from cobalt-containing baths ($S_{III}C_1$, C and S) to cobalt content and to resistivities of corresponding cobalt-free deposits

Barrel Finishing—A Notation

Our attention has been called to the similarity between the drawing of a model tumbling department shown on page 860 of the August issue of PLATING and the Model Roto-Finish department shown on page 912, September, 1948. Reference should have been made in the August issue to the earlier article in the interest of completeness. The arrangement shown in both instances has become a standard and we are indebted to the Roto-Finish Company to have encouraged this by having permitted the publication of the ideal lay-out four years ago.

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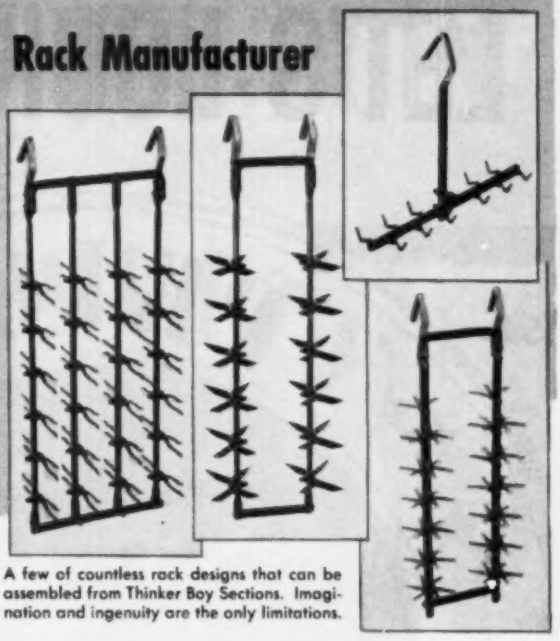
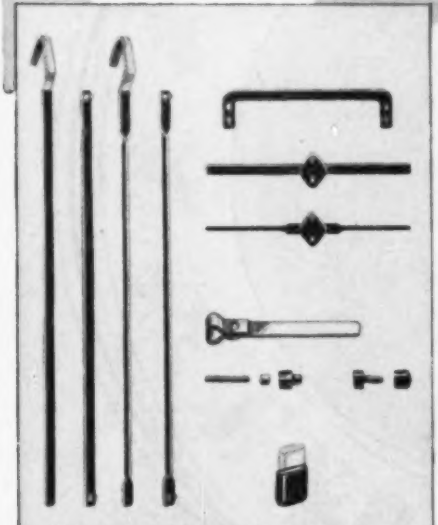


A few of countless rack designs that can be assembled from Thinker Boy Sections. Imagination and ingenuity are the only limitations.



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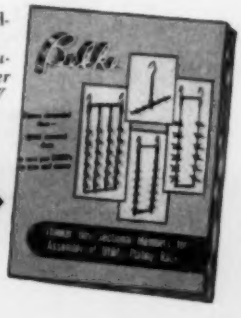

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Tin-lead anodes better for chromium plating

Experience shows that tin-lead alloy assures long service in chromium plating solutions. It provides better resistance to chromic-acid attack over a wide range of operating conditions. Unichrome Anodes not only use solid tin-lead alloy throughout, but also have fused-on copper hooks designed for maximum conductivity; and a body with ample area and thickness for good current distribution and cooler operation.

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The wide current density range at which the Unichrome Pyrophosphate Copper Process plates smooth and fast is maintained over long periods of continuous operation by an improvement in its makeup.

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Zinc plate, when chemically treated in Unichrome Clear Dip and then fortified with a Unichrome Clear Enamel, provides a substitute finish which can satisfy exacting requirements. The Clear Dip forms a bright-as-chromium finish integral with the zinc, while the clear enamel adds extra wear and corrosion resistance to this protective finish without detracting from its brightness. This successful finishing system is in widespread use today on zinc die cast and steel products.

Despite scarcities, many products still offer the powerful appeal of a good quality chromium finish. One method for producing such a finish offers substantial advantages. Corrosion resistance is achieved with alternate materials – copper for the undercoat, organic coating for a topcoat. As for the chromium itself, better, faster plating is being obtained with the Unichrome S.R.H.S. Chromium Bath.

PRODUCTION ADVANTAGES WHEREVER USED

Many plants are plating to specifications with Unichrome S.R.H.S. Chromium 20 to 80% faster than with the ordinary chromium bath – and with less trouble. Self-regulating, it minimizes control and maintains top throwing power. With wider bright plate range, it avoids rejects due to "burning" or "missing." Recent reports give some idea of the great improvements this bath has worked on production, costs, and results:

Fishing line guides are plated in 2/3 the time by S.R.H.S. Chromium, and with better coverage and brighter plate. By using this bath, another plant doubled capacity for plating various parts including zinc die castings – and eliminated the former need for special racking. Companies report savings in bath maintenance, too.

A GOOD COPPER UNDERCOAT

Copper plating on zinc die castings and steel contributes to corrosion resistance, and to a brighter finish. Copper deposited from the Unichrome Pyrophosphate bath makes an excellent base for the chromium. If base metal condition and quality requirements permit, it needs no buffing or chemical polishing. If not, it can be easily polished either way.

CLEAR "ENAMELS" COMPLETE THE SYSTEM

Unichrome Clear Coatings were developed especially for use on plated and polished metals. They add extra protection without detracting from brightness.

Baked-on Coating B-115, while virtually invisible, protects against moisture, handling, corrosives, and wear.

For an air dried or force dried finish, Unichrome Coating A-140 provides corrosion-resistance comparable to many coatings that are baked.

Unichrome Coating B-159 also gives outstanding service. A well known manufacturer for instance, is using it on chromium plated refrigerator shelves and is getting not only superior protection but also twice the film thickness at half the cost of the coating formerly used.

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Disposal of Plating Room Wastes

IV. BATCH VOLATILIZATION OF HYDROGEN CYANIDE FROM AQUEOUS SOLUTIONS OF CYANIDES

(*Continued from the October 1952 issue*)

project No. 10

project director:
BARNETT F. DODGE*

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location:
YALE UNIVERSITY,
NEW HAVEN, CONN.

Acknowledgment is due the Research Committee, Mr. William Tucker, Eastman Kodak Company, Chairman; the Research Directing Sub-Committee, Mr. B. C. Case, Hanson-Van Winkle-Munning Company and Dr. R. M. Wick, Bethlehem Steel Company, Chairman and Vice-Chairman, respectively; and the Project Committee; Mr. Henry B. Smith, R. Wallace & Sons Mfg. Company, Chairman; Mr. L. A. Danse and Mr. D. Milne, General Motors Corporation, and Mr. F. J. Holt, E. I. du Pont de Nemours & Company, for their contributions to this project.

*AUTHORS

V. *Evolution of Hydrogen Cyanide from Thoroughly Aerated and Agitated Solutions*

Preliminary Investigations.—Two different kinds of apparatus were used at first for this investigation: a beaker and a round-bottomed flask with two small openings, one for the inlet air and the other for the outlet air.

Sodium cyanide solutions containing 100 ppm of cyanide (CN) were used. Two runs were made with a dilute synthetic zinc plating solution (Table III, runs 150, 151), and, as expected, the results obtained were the same as with dilute sodium cyanide solutions.

The following main variables were investigated: temperature and rate of aeration. The effect of bubble size of the aerating medium was briefly but not completely investigated. The *p*H was kept at about 2.5 by buffering the solution with a potassium biphthalate-hydrochloric acid buffer.

The effect of temperature on the rate of volatilization is shown in Figs. 6 and 7 and particularly in Fig. 7a. A temperature increase corresponds to a substantial increase in the rate of volatilization of HCN.

In both Fig. 6 and Fig. 7 the curves obtained with aeration are compared with the curves that would be obtained in the same container under similar conditions with mechanical agitation but without aeration. The latter curves were calculated by using average over-all stripping coefficients from Table I. Both graphs show that no advantage is obtained with relatively low rates of aeration as compared with violent agitation only, and that some advantage is gained by aerating in a beaker, as compared with gentle agitation. These apparent conclusions should be complemented with the following information:

(1) The rate of aeration was so low that no frothing was created at the top surface of the liquid.

(2) In the runs where a beaker was used as an aeration tank, the rate of volatilization of HCN was affected by the combined effect of stripping in the body of the liquid, which was caused by aeration, and stripping at the surface under conditions of convection.

(3) In the runs where the flask was used, the air was admitted to the solution through a 5-mm orifice instead of a fritted-glass diffuser.

Items 2 and 3 also give the reasons for obtaining higher rates of volatilization in the beaker than in the flask for the same aeration rate. (See also Fig. 14.)

These exploratory runs gave the necessary information for planning the next and more important phase of this research.

It may be seen from Figs. 6 and 7 that the relation between residual cyanide and time of aeration, when plotted on a semi-log scale, is represented by a straight line. This means that such a relation may be expressed by the following equation:

TABLE III. VOLATILIZATION OF HCN FROM NaCN SOLUTIONS CONTAINING 100 PPM OF CN

Run No.	Soln Vol ml	*p*H of¶ Buffered Soln	Air Flow ft³/ hr	Air Flow* ft³/ft². hr	Air Flow† lb/ft². hr	Average Temp ° F	Time of Aeration hr	Residual CN ppm
11‡	200	6.45	0.215	30.6	....	75	0.5	93.8
							1.0	87.8
12	200	4.5	0.215	30.6	....	75	0.5	91.8
							1.0	85.2
17	200	6.45	0.215	30.6	....	130	0.5	88.6
							1.0	75.8
18	200	4.5	0.215	30.6	....	130	0.5	83.0
							1.0	72.2
19	200	4.5	0.46	65.3	....	130	0.5	74.1
							1.0	56.2
48	200	2.2	0.16	22.7	....	130	0.5	93.5
49	200	2.2	0.46	65.3	....	130	0.5	79.2
57	200	2.2	0.46	65.3	....	154	0.5	70.0
							1.0	49.0
58	200	2.2	0.46	65.3	....	178	0.5	42
							1.0	17.5
59	200	2.2	0.46	65.3	....	168	0.5	54.8
							1.0	30.0
60	200	2.2	0.46	65.3	....	75	0.5	85.2
62	200	2.2	0.46	65.3	0.56	84	0.5	52.0
63	200	2.2	0.46	65.3	0.56	156	0.5	5.2
65	200	2.2	0.46	65.3	0.56	140	1.25	1.1
66	200	2.2	0.46	65.3	0.56	122	0.5	11.8
67	200	2.5	0.46	65.3	0.56	77	0.533	52.5
68	200	2.5	0.46	65.3	0.56	122	0.583	7.8
69	200	2.5	0.46	65.3	0.56	82	0.516	49.2
70	200	2.5	0.46	65.3	0.56	138	0.716	2.6
71	200	2.5	0.63	89.5	0.77	138	0.4	11.4
72	200	2.5	0.19	27.0	0.22	138	0.616	10.4
73	150	2.5	0.37	20.0	2.64	138	0.667	32.6
74	400	2.5	0.46	32.5	0.56	138	0.466	28.6
75	200	2.5	0.46	65.3	0.56	104	0.633	20.0
76	200	2.5	0.46	65.3	0.56	115	0.516	15.3
77	150	2.5	0.52	98.5	3.71	100	0.4	65.5
78	150	2.5	0.64	122.0	4.60	100	0.4	51.5
79	150	2.5	0.16	30.3	1.79	100	0.65	63.5
150§	200	2.7	0.16	30.3	1.79	100	0.65	62.8
151§	200	2.7	0.64	122.0	4.60	100	0.4	52.1

*Air flow in cu ft per cu ft of solution per hour

†Air flow in lb per sq ft of cross-sectional area of container per hour at 25° C, 1 atm

‡In runs 11–60, the cyanide solution was treated in a 500-ml Claissen flask, and air was bubbled through a 5-mm inlet.—
In runs 62–72 and 74–76, the cyanide solution was treated in a 600-ml beaker with cross-sectional area = 0.064 ft². The air was bubbled through a sintered-glass gas dispenser with maximum pore size of 160 microns.—
In runs 73 and 77–79 the cyanide solution was treated in a 35 × 180-mm test tube and, the same sintered-glass gas dispenser was used for the bubbling of air.

¶All solutions were buffered with a potassium-biphthalate–hydrochloric acid buffer

§Synthetic zinc plating solution diluted to 100 ppm of total CN

$$\log\left(\frac{C}{C_o}\right) = k\theta \qquad (6)$$

where C and C_o are the final and initial concentrations of total cyanide respectively, k is a rate constant, and θ is the time of treatment.

Final Investigations.—The investigations were continued by using a stoppered wide-mouthed bottle (500 ml) with an air inlet and an air outlet. This apparatus was chosen in preference to an open container for two reasons: (1) to eliminate the effect of the surrounding air on the volatilization of HCN; (2) to provide, if necessary a means for sampling the outgoing air and thus making it possible to calculate values of over-all stripping coefficients as a function of time from the periodical determination of the cyanide concentration in the liquid and in the outgoing air during a run. It was found later that it was not necessary to determine the concentration of cyanide in the outgoing air and that a rate constant k could be calculated solely

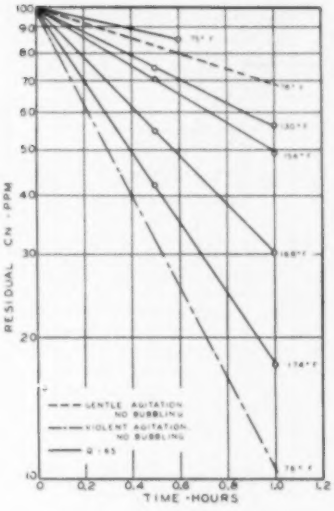

Fig. 6. Effect of agitation, aeration, and temperature on evolution of HCN from cyanide solutions not exposed to the surrounding air (in flask). Air was bubbled through a single orifice, 0.2 inch in diameter

TABLE IV. THE BATCHWISE VOLATILIZATION OF HCN FROM ACIDIFIED NaCN SOLUTIONS BY AERATION

Initial concentration of cyanide as CN = 100 ppm; *p*H of solution = 2.00

Run No.	Air Flow ft³/ hr	Air Flow* ft³/ft², hr	Average Temp °F	Time of Aeration hr	Residual CN (exp) ppm	Residual CN (calc'd) ppm	Deviation† %
81	9.7	1375	78	0.300	16.90	17.9	+ 5.9
82	9.7	1375	78	0.516	6.50	5.2	−20.0
83	9.7	1375	78	0.150	36.20	42.5	+17.4
84	9.7	1375	78	0.667	2.60	2.24	+13.8
85	5.75	816	78	0.200	50.00	50.3	+ 0.6
86	5.75	816	78	0.350	29.10	30.2	+ 3.8
87	5.75	816	78	0.582	14.55	13.6	− 6.5
88	5.75	816	78	1.050	2.34	2.75	+17.5
89	3.3	468	78	0.583	30.20	31.1	+ 3.0
90	3.3	468	78	1.035	13.50	12.1	−10.4
91	1.9	270	78	1.400	14.00	18.7	
92	1.9	270	78	0.750	32.20	24.5	
93	0.68	96	78	0.850	65.00	66.0	+ 1.5
94	0.68	96	78	1.112	58.70	58.2	− 0.9
95	7.1	1010	109	0.400	3.38	3.92	+16.0
96	7.1	1010	109	0.500	2.08	1.76	−15.4
97	7.1	1010	128	0.133	23.90	24.8	+ 2.9
98	7.1	1010	128	0.250	6.75	7.23	+ 7.1
99	7.1	1010	144	0.100	27.80	28.8	+ 3.6
100	7.1	1010	144	0.217	6.25	6.58	+ 5.3
101	3.2	455	144	0.250	19.80	19.7	− 0.5
102	4.3	610	144	0.250	12.00	12.6	+ 5.0
103	1.85	263	144	0.484	12.00	12.7	+ 5.8
104	1.85	263	144	0.317	27.60	26.1	− 5.4
105	4.3	610	118	0.416	8.06	8.12	+ 0.7
106	3.2	455	118	0.416	13.50	14.0	+ 3.7
107	1.85	263	118	0.500	21.80	22.0	+ 0.9

*Flow rate in ft³ of air per ft³ of solution per hour
†Standard deviation = 9.4 per cent; maximum deviation = 20 per cent

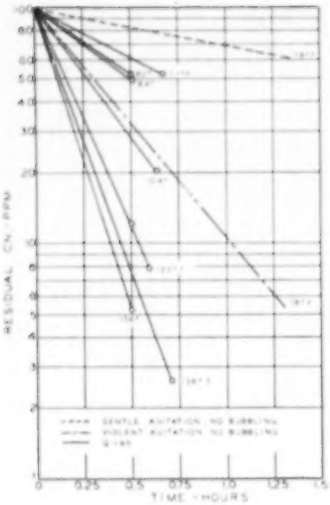

Fig. 7. Effect of agitation-aeration, and temperature on evolution of HCN from cyanide solutions exposed to the surrounding air (in beaker). Air was bubbled through a fritted-glass diffuser with maximum pore size of 0.0063 inch

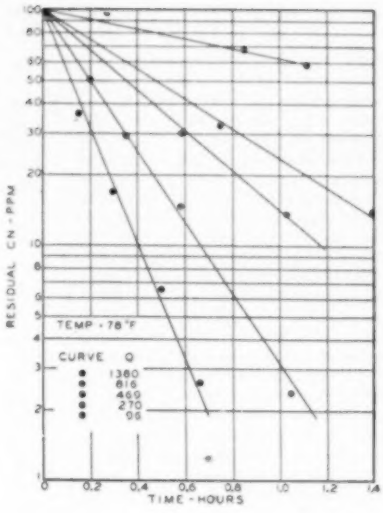

Fig. 8. Effect of rate of aeration on the evolution of HCN from cyanide solutions

from the residual concentration of cyanide in the aerated solution as a function of time. This rate constant k is a function of K_{Oa}, the over-all stripping coefficient, and is more convenient to use in this particular case than K_{Oa}. (See derivation on p. 13.) Since it was expected that k was a function of the rate of aeration and of the temperature, the effect of these variables was investigated. At first, the air flow rate was varied and the temperature was kept constant at 78° F (26° C). The results obtained are shown in Figs. 8 and 8a. The values of k, the negative of the slope of each line in Fig. 8, were plotted *vs* the air flow rate, and a straight line relation was obtained (Fig. 9), and its slope was determined.

In a second set of runs, the temperature was varied, and the air flow rate was kept constant at 1010 cu ft per cu ft of solution per hour. Values of k were determined as in the previous case and were plotted *vs* the temperature as shown in Fig. 10. A straight-line relation was obtained.

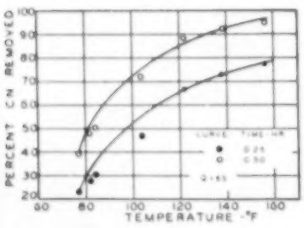

Fig. 7a. Effect of temperature on the evolution of HCN from cyanide solutions (from Fig. 7)

It was then thought that the slope of the line relating values of k to temperature would be independent of the flow rate. However, upon experimental investigation, it was found that this was not true. Instead the slope of the k-temperature line decreased with increasing air flow as shown in Fig. 11. There the ratio of k_t, the value of the rate constant at any temperature, to k_{78}, the value of the rate constant at 78° F, was plotted *vs* the temperature, since it had been decided to develop an empirical equation in which the temperature effect would be used as a correction factor for the rate equation at 78° F (26°C).

The slope of the curves in Fig. 11 was plotted *vs* the air flow on a log–log paper as shown in Fig. 12. A straight-line relation was obtained, the slope of which made it possible to determine the dependence of the k-temperature curves on the rate of aeration.

The following final equation was obtained to correlate the effect of time, temperature, and air flow rate on the residual cyanide concentration left at any time in the treated solution:

$$k_t = (1.77 \times 10^{-2}\, Q + 0.04)\left[1 + \frac{0.113}{Q^{0.19}}\,(t - 78)\right] \qquad (7)$$

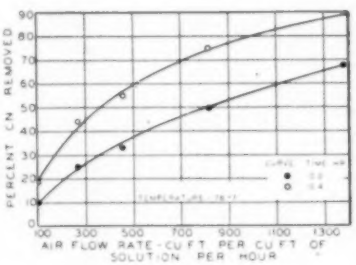

Fig. 8a. Effect of rate of aeration on the evolution of HCN from cyanide solutions (from Fig. 8)

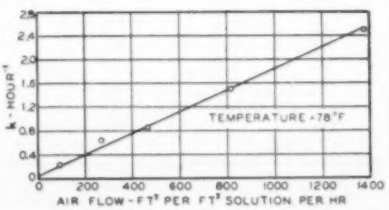

Fig. 9. Effect of rate of aeration on rate constant k (from Fig. 8)

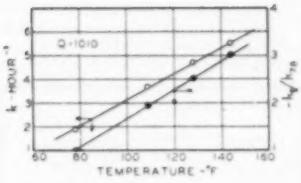

Fig. 10. Effect of temperature on rate constant k, for the same aeration rate

where Q is the volumetric air flow in volume of air per volume of solution per unit time, and t is the temperature of treatment in °F. This equation is based on data obtained within the following experimental range of variables:

Air flow = 50–1400 cu ft per cu ft of solution per hour (or $m^3/m^3.hr$)

Temperature = 78–144° F (26–62° C)

It is believed that this equation may be used without appreciable error for higher air-flow rates than those investigated, but it is not expected to apply to air flow rates below the lower limit of the range investigated, because in the latter case the solution may not be well mixed by air agitation, and the assumption that the concentration of cyanide is the same throughout the solution at any time would not hold.

The substitution of the value for k_t (as calculated by equation 7) in equation 6 enables one to calculate the time necessary to reduce the cyanide concentration of a solution to a desired value by varying either the temperature or the air-flow rate or both. (See sample calculation on p. 14.)

Equation 7 together with equation 20, which is derived in the Appendix, may be used to calculate values of over-all stripping coefficients and to relate them to the important variables affecting batch stripping.

However, as discussed previously, it is more convenient in this particular case to correlate these results on the basis of values of k rather than of K_{Ga}.

This equation applies to thoroughly agitated and aerated solutions. In actual practice, where the depth of the solution is much greater than the depth of the solution investigated, there may be considerable difference between the concentration of cyanide at the top and at the bottom of the solution, which may or may not be eliminated solely by air agitation. In this case, however, uniform compositions could be obtained by the addition of mechanical agitation*.

The effect of bubble size and the bubble frequency of the aerating medium on the volatilization of HCN may be seen by comparing some of the results (Fig. 6) obtained by introducing air to the cyanide solution through a 5-mm (0.197-in) orifice with those obtained with a fritted-glass tube containing a large number of very small orifices with a maximum size of 160 microns (0.0063 inch) (Fig. 13). These comparisons, which were made at relatively low rates, show that the manner of aerating is important. A large number of small bubbles per unit time is to be preferred to a small number of large bubbles, because the area of contact between gas and liquid, the degree of agitation, and consequently the stripping capacity per unit volume of aerating medium are greater in the former case than in the latter. However, this difference is less accentuated at relatively higher rates, where the size of the bubble is somewhat independent of the size of the orifice. The results of an investigation of this type are reported in the literature[7], where for a bubble frequency of 40 to 50 per second, bubbles 0.23 cm (0.095 inch) in diameter were produced by capillaries varying in diameter from 0.0138 to 0.0340 cm (0.00544–0.0134 inch)†, the size of the bubble being a function of gas rate only. However, no information is available on the maximum size of orifice for which the foregoing discussion holds true. Such information could be quite useful, since orifices with sizes within the range described above may become easily clogged with insoluble metal-cyanide precipitates or other insoluble impurities, and larger orifice sizes may be required. It is expected, however, that even with orifice sizes as high as ⅛ inch (3 mm) in diameter, the bubble size of the gas will be primarily dependent on the rate of aeration, rather than the orifice size, provided that such rate is relatively high. Even at such very low rates as 65 cu ft per cu ft of solution per hour, the amount of HCN stripped when air is introduced to the solution through fritted glass is less than twice the amount stripped when air is introduced to the solution through a single orifice, although the diameter of the latter is about 30 times that of the largest pore in the fritted glass. It should also be realized that this particular comparison suffers from one disadvantage, i.e., that it compares one relatively large orifice with not one but an unknown number of much smaller orifices; however, it gives an indication of the relative degree of aeration and stripping obtainable even with a relatively large orifice (0.2 inch, 5 mm). A more detailed investigation of the subject would be beyond the scope of this paper.

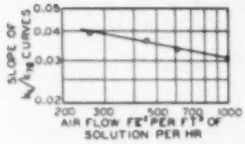

Fig. 12. Effect of air rate on slope of k_t/k_{78}–temperature curves

Conclusions

1. The Henry's law constant (H) for HCN in very dilute solutions (less than 4000 ppm) which was experimentally determined for temperatures above 18° C

*Equation (7) was developed for cases where the ratio of the height of the solution to the diameter (or average width) of the tank is about 1. It is believed, however, that it will apply to ratios varying from ½ to 2 on the basis of some experimental work done on a laboratory and pilot-plant scale.

†Orifices of this size are commonly found in commercial porous metal or carbon plates.

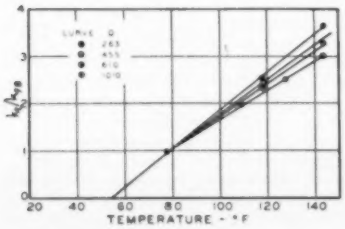

Fig. 11. Effect of temperature on the rate constant k, for varying aeration rates

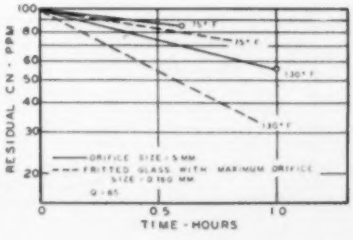

Fig. 13. Effect of bubble size of the aerating medium on volatilization of HCN from cyanide solutions

TABLE V. TIME OF TREATMENT OF CYANIDE SOLUTIONS FOR REDUCTION OF CN CONCENTRATION FROM 75 TO 1 PPM

Treatment Conditions	K_G lb-mole/hr.ft².atm	H atm/mole fraction	Time for 100,000 gal hr	Time for 10,000 gal hr
64.4° F, gentle agitation	0.0286	5.0	2500	654
158° F, gentle agitation	0.1150	8.5	367	66.5
64.4° F, violent agitation	0.18	5.0	388	72.2
158° F, violent agitation	0.724	8.5	57	10.6

TABLE VI. REDUCTION IN TREATMENT TIME BY INCREASE IN TEMPERATURE

Time at 78° F hour	Vol of Solution gal	Air Flow Rate cfm	Time at 100° F hour
10	10,000	1850	4.8
10	100,000	18500	4.8
20	10,000	675	8.73
20	100,000	6750	8.73

(64° F), increases at first slowly with temperature and very rapidly above about 65° C (149° F).

2. The rate of volatilization of cyanide at any time from a solution is a function of the concentration of molecular HCN. Since the ionization constant of HCN is very small (7.2×10^{-10} at 25° C (77° F)), more than 99 per cent of the cyanide present as hydrogen cyanide is in the un-ionized form in practically any cyanide solution.

3. At a *p*H value of about 6.5, more than 99 per cent of the simple cyanide is present as HCN. The zinc cyanide complex begins to break down at a *p*H of about 6.9, and the copper cyanide complex begins to break down at a *p*H of about 4.5.

Plating solutions should be acidified to a *p*H value somewhat less than 3.5 in order that all of the cyanide be volatilized in the shortest time.

The decomposition of a copper cyanide complex by acidification causes the precipitation of cuprous cyanide, which decomposes very slowly unless heated in the presence of chlorides. Zinc cyanide, on the contrary, after having been precipitated through the decomposition of a zinc cyanide complex, decomposes very readily at a *p*H of about 3.5.

4. If the *p*H of an acidified cyanide solution is such that all of the cyanide is present as HCN, any further lowering of the *p*H does not affect appreciably the rate of volatilization of HCN.

5. The value of the over-all absorption coefficient (K_G) for the stripping of HCN from a cyanide solution agitated at such a rate that no vortex forms at the surface, and exposed to the air under conditions of free convection, is about 0.029 lb-mole/hr.ft².atm (0.142 kg-mole/hr.m².atm). If the solution is agitated violently, the value of K_G may be raised to as high as 0.18 (0.88). The over-all absorption coefficient is not affected by *p*H, type or concentration of the cyanide in the solution, but it increases with temperature and with increasing agitation, since the latter causes the formation of a vortex at the surface, thus increasing the actual stripping area; it also increases the degree of aeration at the surface.

The values of time of treatment in Table V have been calculated to reduce the cyanide (CN) concentration from 75 to 1 ppm in 10,000 and 100 000 gal (38,000 and 380,000 l) of acidified solution, respectively, stored in cylindrical reservoirs with the height equal to the diameter.

6. The rate of volatilization of HCN from a stagnant cyanide solution, such as an impounded solution, decreases as the depth of the solution increases, because the surface of the solution becomes depleted of cyanide in the early stages of the volatilization process, and the rate of volatilization becomes controlled by the diffusivity of HCN in water, which is 1/10,000th of the diffusivity of HCN in air.

7. The rate of volatilization of HCN from an aerated solution is mainly a function of the initial concentration of HCN in the solution, the rate of aeration, and the temperature. The *p*H value does not have any effect on the rate of removal of cyanide as long as most (99 per cent) of the cyanide is present as HCN.

The effect of the above mentioned variables on the rate of volatilization of HCN may be represented by the following equation:

$$\log_{10} \frac{C_o}{C} = (1.77 \times 10^{-2} Q + 0.04) \left[1 + \frac{0.113}{Q^{0.19}} (t - 78) \right] \theta \quad (8)$$

where C_o = initial concentration of hydrogen cyanide in ppm

C = final concentration of hydrogen cyanide in ppm

θ = time in hours

Q = air flow in cu ft per cu ft of solution per hour

t = temperature in ° F

The foregoing equation has been derived from laboratory small-scale experimental data covering an air flow range of 50–1400

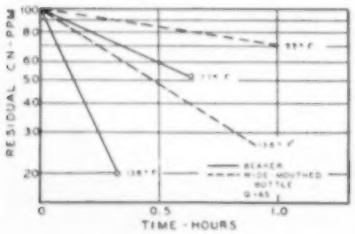

Fig. 14. Added effect of exposure of the surface of the aerated solution to the surrounding air (under conditions of free convection) on rate of volatilization of HCN from cyanide solutions

cu ft of air per cu ft of solution per hour and a temperature range of 78–144° F (26–62° C). The standard deviation* of the calculated values from the experimental values has been calculated to be 9.4 per cent and the maximum deviation −20 per cent.

This equation may be considered to apply where optimum agitation and aeration are feasible. It is believed that these conditions may be approached in an industrial-scale batch-volatilization† unit by the use of porous plates, gas diffusers, and mechanical agitation.

Table VI contains in the third column rates of air flow (in cu ft/min) necessary to reduce the cyanide (CN) concentration from 75 to 1 ppm in 10,000 and 100,000 gal (38,000 and 380,000 l) of acidified solutions, respectively, at a temperature of 78° F (26° C) and treating times of 10 and 20 hours; the fourth column shows the time necessary for removal of cyanide at the same flow rates but at a higher temperature (100° F; 38° C). These values have been calculated by using equation 6.

The added effect of aeration on the stripping of hydrogen cyanide from acidified cyanide solutions may be noted by comparing the time of treatment in Tables VI and V respectively.

These results show how the air flow requirements may be reduced by increasing the temperature. Thus a batch HCN-volatilization treatment of 100,000 gallons of cyanide solution per day at 102° F (38° C) will require about one-fourth of the air rate needed at 78° F (26° C), because the time of treatment is so shortened that four 25,000-gal (94,500-l) batches can be treated throughout one day.

8. In the design of a plant for the batch volatilization of hydrogen cyanide from acidified cyanide solutions, as in the design of any plant, one must take into consideration what effect have the main physical variables on the size and capacity of the equipment and therefore on the capital and operating cost. The most important variables to be taken into consideration in this particular case are: air flow, temperature and time of treatment. These variables are not all independent. An increase in temperature will correspond to a decrease in the volumetric air-flow requirements and therefore to a decrease of the required capacity of the compressor, if the cross-sectional area of the treating tank is kept constant. However, an increase in temperature above the temperature of the surroundings will involve heating with some heating medium, such as steam, which, unless available as waste steam from other plant operations, introduces an added cost that must be compared with the saving obtained by using a smaller-size compressor and less mechanical energy. A decrease in the cross-sectional area of the treating tank will decrease the volumetric air-flow requirements for the same volume and concentration of cyanide solution, but the pressure of the incoming air must be increased proportionally to the increased depth of the solution; therefore the mechanical-energy requirements are decreased because of a decrease of volumetric air flow and are at the same time increased because of increased outlet pressure of the air from the compressor. Again, one must balance the effect of these two variables on cost.

An attempt by experimental work to determine what relation of the variables will give optimum operating conditions from an economic point of view could be lengthy and costly; however, this inconvenience can be eliminated by using equation 7 to calculate the effect of the variables, such as air flow and temperature, which would otherwise require experimental work, and well-known relations on the stripping of HCN, and by using well-known correlations to calculate energy requirements for the air blower and possibly the heating of the cyanide solution.

NOMENCLATURE

A = superficial area of solution, in sq ft

C = concentration of total cyanide (CN) in solution, in lb-mole/cu ft

C_L = concentration of hydrogen cyanide as CN in solution at any time, in lb-mole/cu ft

H = Henry's Law constant $H = \frac{P}{C_L}$, in atm/mole fraction

K_a = ionization constant

K_G = over-all absorption coefficient, in lb-mole/hr.sq ft.atm

$K_G a$ = over-all absorption coefficient, in lb-mole/hr.cu ft.atm

M = solute concentration in gas phase, in lb-mole/lb-mole

N_A = moles of solute transferred per unit time, in lb-mole/hr

N_G = moles of solvent gas bubbled per unit time, in lb-mole/hr

Q = volume of air introduced in solution per unit volume of solution per unit time, in cu ft/cu ft.hr

V_L = volume of solution, in cu ft

k = rate-of-stripping constant, in hr^{-1}

p = partial pressure of solute gas, in atm

t = temperature, in ° F

x = mole fraction of the more volatile component in the liquid phase

y = mole fraction of the more volatile component in the gaseous phase

θ = time, in hr

$(\Delta C)_m$ = log mean concentration of solute gas at the film boundaries, in lb-mole/cu ft

$(\Delta p)_m$ = log mean partial pressure of solute gas at the film boundaries, in atm

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APPENDIX

The Relation between the Rate of Volatilization Constant for HCN and the Over-all Stripping Coefficient for Batch Volatilization of HCN from Acidified Cyanide Solutions

The calculation applies to the experimental arrangement shown in Fig. 15, in which perfect agitation is assumed to exist.

$$\frac{dN_A}{d\theta} = V_L \frac{dC}{d\theta} = N_G(M_1 - M_2) = \underset{(8)}{} \underset{(9)}{} H K_G a V_L (\Delta C)_m \underset{(10)}{}$$

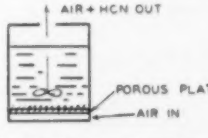


Fig. 15. Experimental arrangement

*Standard deviation is defined as the square root of the sum of the squares of the individual deviations divided by the number of observations.

†The experimental values of residual cyanide concentration obtained in pilot-plant investigations with a 75-gal batch have been found to be in fair agreement with values calculated by using equation 8.

where

$dN_A/d\theta$ = rate of cyanide stripping at any instant, in lb-moles/hr

V_L = volume of solution, in cu ft

$dC/d\theta$ = rate of change in concentration of solute at any instant, in lb-moles/hr cu ft

C = concentration of solute at any time, in lb-moles/cu ft

N_G = flow rate of air through solution, in lb-moles/hr

M_1 = concentration of solute in inlet air, in lb-moles/lb-mole

M_2 = concentration of solute in outlet air, in lb-moles/lb-mole

K_Ga = over-all stripping coefficient, in lb-moles/hr. cu ft. atm

$(\Delta C)_m$ = logarithmic mean of solute concentration in the bulk of the gas and the liquid phases

$$(\Delta C)_m = \frac{(C_{L_1} - C_{G_1}^*) - (C_{L_2} - C_{G_2}^*)}{2.3 \log_{10} \dfrac{C_{L_1} - C_{G_1}^*}{C_{L_2} - C_{G_2}^*}} \quad (11)$$

where

C_G^* = concentration of solute in the liquid phase in equilibrium with the concentration of solute in the gas phase

$p = HC_G^* = MP$ (12)

where

H = Henry's Law constant, in atm/mole-fraction

p = partial pressure of solute in gas phase, in atm

P = total pressure, in atm

By substituting (12) in (11) and realizing that $C_{G1} = 0$

$$(\Delta C)_m = \frac{p_1/H}{2.3 \log_{10} \dfrac{C_L}{C_L - p_1/H}} \quad (11a)$$

where C_L is constant throughout the solution at any time

By equating (9) and (10), and making the necessary substitutions

$$+\frac{N_G p_2}{P} = HK_Ga\,V_L \frac{p_1/H}{2.3 \log_{10} \dfrac{C_L}{C_L - p_1/H}} \quad (13)$$

$$2.3 \log_{10} \frac{C_L}{C_L - p_1/H} = + \frac{PK_Ga V_L}{N_G} \quad (13a)$$

$$\text{or } C_L - p_1/H = C_L e^{-PK_Ga V_L/N_G} \quad (13b)$$

By letting

$$\alpha = e^{-PK_Ga V_L/N_G} \quad (14)$$

substituting (14) in (13b) and rearranging

$$p_1 = HC_L(1 - \alpha) \quad (15)$$

By equating (8) and (9), and realizing that $M_1 = p_2/P$

$$V_L\,dC/d\theta = -N_G p_2/P \quad (16)$$

and substituting (15) in (16), the following expression is obtained for the rate of change in concentration of HCN solute with time:

$$dC/d\theta = -HN_G/V_L P\,(1 - \alpha)\,C_L \quad (17)$$

Equation 17 is rearranged and integrated between the limits $\theta = 0$ and $\theta = \theta$, $C_L = C_0$ and $C_L = C_L$ as follows:

$$\int_{C_0}^{C_L} \frac{dC_L}{C_L} = -\frac{HN_G}{PV_L}(1 - \alpha) \int_0^\theta d\theta \quad (18)$$

from which the following expression is obtained:

$$2.3 \log \frac{C_0}{C_L} = \frac{HN_G}{PV_L}(1 - \alpha)\,\theta \quad (19)$$

By comparing equation (6) on p. 9, which correlated the experimental data relating concentration of CN to the time θ, with equation (19), and substituting the value at α from equation (14), the expression for k in terms of the over-all stripping coefficient K_Ga is obtained as follows:

$$k = \frac{HN_G}{2.3V_L P}(1 - e^{-PK_Ga V_L/N_G}) \quad (20)$$

SAMPLE CALCULATIONS

I. *Determination of percentage of HCN present in a sodium cyanide solution containing 100 ppm of total CN and buffered at pH 9.0*

$9 = \log 1/[H^+]$; $[H^+] = 10^{-9}$

By substituting the value of $[H^+]$ and [C] in equation 4, the following relation is obtained:

$$\frac{(10^{-9})(100/26000 - [HCN])}{[HCN]} = 7.2 \times 10^{-10}$$

$$0.00384 \times 10^{-9} - 10^{-9} \times [HCN] = 0.72 \times 10^{-9}\,[HCN]$$

$$[HCN] = \frac{0.00384}{1.72} = 0.00223 \text{ g-mole/l}$$

or 58.1 per cent of total CN content

II. *Calculation of K_G from run 64, Table I*

Initial total CN = 100 ppm
Temperature = 70° C
Time = 2/3 hour
Volume of liquid = 200 ml
pH = 2.50 (by using buffer)

This pH value is below that which is obtained from the dissociation of HCN as shown by the following calculation:

$$\frac{[H^+]^2}{0.00384} = 7.2 \times 10^{-10}$$

$$[H^+] = \sqrt{2.77 \times 10^{-12}} = 1.65 \times 10^{-6}$$

pH = log $1/1.65 \times 10^{-6}$ = 5.782

Also, more than 99 per cent of CN is present as HCN:

$$N_A = \frac{(200)(100 - 19.5)}{(26)(10^6)(0.667)} = 0.00093 \text{ g-mole/hr}$$

From Fig. 1, at 70° C $\left(\frac{1}{T} = \frac{1}{273.2 + 70} = 0.00292\right)$:

H = 8.5 atm/mole fraction

$$p_1 = 8.5\left(\frac{100/26}{100/26 + 999{,}900/18}\right) = 5.9 \times 10^{-4} \text{ atm}$$

$p_2 = (0.195)(5.9 \times 10^{-4}) = 1.15 \times 10^{-4}$ atm

Top surface area of liquid = 0.572 dm²

$$(\Delta p)_m = \frac{(5.9 - 1.15)(10^{-4})}{2.3 \log \frac{5.9}{1.15}} = 2.91 \times 10^{-4} \text{ atm}$$

$$K_G = \frac{N_A}{A(\Delta p)_m} = \frac{9.3 \times 10^{-4}}{(2.91 \times 10^{-4})(0.572)} =$$

‖ eq. 5, p. 14

5.6 g-mole/hr. dm². atm = 0.115 lb-mole/hr. ft². atm

III. *Calculation of time necessary to reduce the cyanide (CN) concentration from 75 to 1 ppm in 100,000 gal of an acidified cyanide solution at 95° F, at a rate of aeration of 20,000 cfm*

Volume of air bubbled per hour = $(20{,}000)(60) = 1.2 \times 10^6$ cu ft

$$Q = \left(\frac{1.2 \times 10^6}{1 \times 10^5}\right) 7.48 = 149.5 \text{ cu ft/cu ft. hr}$$

By substituting the proper values in equation 7:

$$k = [(1.77 \times 10^{-3})(149.5) + 0.04]\,[1 + 0.113/(149.5)^{0.13}\,(95 - 78)] = 0.53 \text{ hr}^{-1}$$

By substituting the value of k in equation 6:

$$\log_{10} \frac{75}{1} = 0.53\,\theta$$

$\theta = 1.874/0.53 = 3.54$ hours

ADDENDUM

THE USE FOR DESIGN PURPOSES OF THE EMPIRICAL CORRELATION FOR THE STRIPPING OF CYANIDE BY AERATION.

Laboratory Investigations

Some laboratory data obtained by investigators at the Water and Waste Laboratory of the Ford Motor Company* were compared with values calculated with equation 8 shown in the paper. The experimental data had been obtained with acidified cadmium waste cyanide solutions (1500 ml) which had been aerated at *p*H values somewhat less than 3 and at room temperature. Inasmuch as the only hint as to the temperature of the water was that the runs had been made at the end of July, it was assumed that the temperature was somewhere between 68 and 78° F (20 and 26° C) and calculations were made accordingly at these two temperatures.

The experimental and calculated results, which are plotted in Figs. 16, 17 and 18, agree fairly well among themselves.

Pilot Plant Runs†

Dilute zinc plating solutions were aerated in a rectangular stainless-steel tank with a capacity of about 55 gallons (208 l) and with provisions for steam heating.

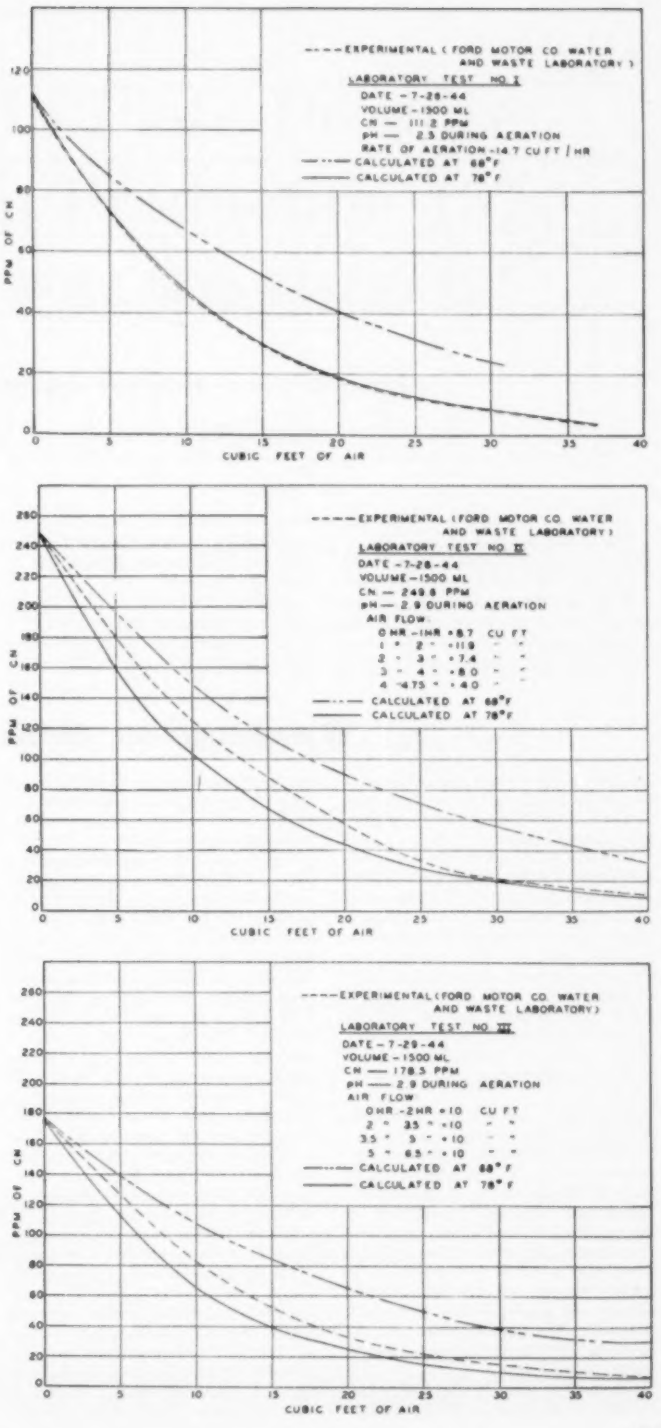
TABLE VII. BATCH ACIDIFICATION AND AERATION OF DILUTE ZINC PLATING SOLUTIONS ON A PILOT PLANT SCALE

Run No.	Time min	Temp °F	*p*H	Air Flow ft³/ft²/hr	Experimental Total CN ppm	Calculated Total CN ppm
1a	0	78	2-3	34.8	523	523
	37				416	452
	73				333	384
	111				280	340
	173				210	266
2a	0	126	2-3	25.0	396	396*
	18				312	310
	37	125			250	240
	64	145			135	166
	87	135			78	122
	118	126			42	80
	161	131			28	44.7
	197	120			13	27.3

*An average temperature of 130° F was used in the calculations

*J. E. Cooper, Private Communication (May 1, 1951).

†These investigations were carried out at R. Wallace & Sons Manufacturing Company, Wallingford, Conn., where some plant space was made available through the courtesy of Mr. Henry B. Smith.


EXPERIMENTAL (FORD MOTOR CO. WATER AND WASTE LABORATORY)
LABORATORY TEST NO. I
DATE – 7-28-44
VOLUME – 1500 ML
CN — 111.2 PPM
pH — 2.3 DURING AERATION
RATE OF AERATION – 14.7 CU FT / HR
CALCULATED AT 68°F
CALCULATED AT 78°F
PPM OF CN
CUBIC FEET OF AIR
EXPERIMENTAL (FORD MOTOR CO. WATER AND WASTE LABORATORY)
LABORATORY TEST NO. II
DATE – 7-28-44
VOLUME – 1500 ML
CN — 249.8 PPM
pH — 2.9 DURING AERATION
AIR FLOW:
0 HR – 1HR • 8.7 CU FT
1 " 2 " • 11.9 " "
2 " 3 " • 7.4 " "
3 " 4 " • 8.0 " "
4 " 4.75 " • 4.0 " "
CALCULATED AT 68°F
CALCULATED AT 78°F
PPM OF CN
CUBIC FEET OF AIR
EXPERIMENTAL (FORD MOTOR CO. WATER AND WASTE LABORATORY)
LABORATORY TEST NO. III
DATE – 7-29-44
VOLUME – 1500 ML
CN — 178.5 PPM
pH — 2.9 DURING AERATION
AIR FLOW
0 HR – 2 HR • 10 CU FT
2 " 3.5 " • 10 " "
3.5 " 5 " • 10 " "
5 " 6.5 " • 10 " "
CALCULATED AT 68°F
CALCULATED AT 78°F
PPM OF CN
CUBIC FEET OF AIR

Figs. 16, 17 and 18. A comparison between experimental results obtained in the aeration of acidified cadmium cyanide waste and values calculated by equation 8

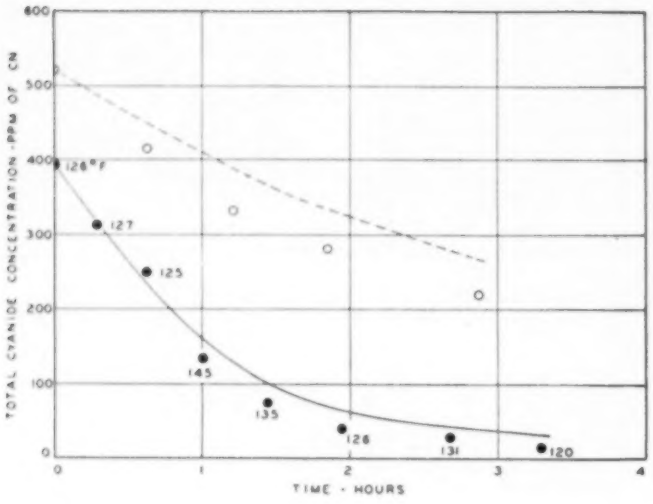


Fig. 19. Batch acidification and aeration of dilute zinc cyanide plating solutions on a pilot-plant scale. Drawn curves are based on calculated values. Experimental values shown by open circles for temperature = 78° F, volume of solution = 5.3 cu ft, Q = 34.8 cu ft/sq ft hr and 2 >pH <3, and by filled circles for average temperature = 130° F, volume of solution = 6 cu. ft, Q = 26 cu ft/sq ft hr and 2 > pH <3

The air was supplied by a small portable air compressor with a capacity of about 250 cu ft (7.08 m³) of air per hour, and it was introduced to the solution through four perforated ½-inch (13-mm) (nominal size) steel pipes screwed to a cross fitting and extending from wall to wall. The perforations had a 1/32-inch (0.8-mm) diameter and were spaced ½ inch (13 mm) apart.

Two runs were made at 78° F (26° C) and at an average temperature of 130° F (54° C) respectively. The results obtained are shown on Table VII and are plotted for comparison with the calculated values in Fig. 19. Again there is a fair agreement between the experimental and the calculated values.

On the basis of this information, it seems that equation 8 can be used with a fair degree of accuracy to obtain design data.

Washington Orders

Copies of NPA orders and publications may be obtained from National Production Authority, Washington 25, D. C., or from any of its local offices.

In one of its recent weekly issues, the Defense Production Record published by the NPA states that since Korea, when the chemical industry expansion program began, over two-thirds of the forty-three expansion goals have been reached. Included among these are: methyl and ethyl alcohols, carbon tetrachloride, hydrofluoric acid, hydrogen peroxide, sodium cyanide, sodium carbonate and activated carbon. Programs still to be completed include those for tri- and perchlorethylene.

Aluminum.—Announcement was made on October 1 of an expansion goal to increase total aluminum production by 200,000 short tons. An invitation was made at the same time to American business concerns desiring to participate in this expansion to send in firm proposals.

Designation of Scarce Materials.—An amendment to DSM 1 on September 9 deleted from the list of scarce materials sulfuric acid and corundum grains and superfines. The same materials were deleted from NPA Inventory Control Regulation 1 issued on the same date.

Cobalt.—The NPA advised the Paint Industry at two meetings during September that little improvement can be hoped for at the present time on the availability of this metal and its compounds due to stockpiling requirements.

Copper.—The Wire and Cable Industry Advisory Committee at a meeting on September 30 urged the government to publicize the fact that copper is still in short supply and not plentiful as is popularly believed, and that the government also defer stockpiling additional copper until industry can catch up with the back-order load which is about five months. They urged NPA to make a thorough survey of the entire copper supply-and-demand situation along with a study of how much of the ordered overseas copper remains undelivered. NPA conceded that the copper situation is in a "state of confusion". At a previous meeting on September 25 the slow deliveries of Chilean copper were blamed on an acute shortage of shipping space. At a Primary Copper Producers meeting on October 2 NPA agreed that its estimates of the amount of primary and secondary copper were probably optimistic in total and "rashly optimistic" as far as custom smelter production is concerned. During all this, NPA order M-65 on the Conservation of Metal in Printing Plates to conserve supplies of copper, aluminum, zinc, chromium and nickel was revoked, the revocation being made possible by the "easing of the metal supply situation". The small quantities of nickel needed by the printing industry offered no bar to the revocation which was issued on September 25. In the meantime the Defense Production Administration announced on September 22 that distribution of controlled materials for the first quarter of 1953 will approximate allotments of copper and aluminum as in the fourth quarter of 1952, but only 75 per cent of the steel.

Graphite and Carbon Electrodes.—NPA order M-66 and interim Direction 1 controlling artificial graphite and carbon electrodes was revoked on September 22.

Mechanically Mixed Chemical Specialties Amendment 55 to Ceiling Price Regulations dated September 15 simplifies the requirements for reporting ceilings on mechanically mixed chemical specialties such as those used in metal refining and in electroplating.

Tin.—The NPA announced on September 17 that larger supplies of tin are being received and further revision and eventual revocation of order M-24, Tin and Terneplate is in prospect in the not too distant future, probably six months or less. In an amendment to NPA order M-8, dated September 23 permission was granted for the use of body solder in the production of automobiles and trucks.

Major Tin Plate Producer Steps Up Production 15% Using **PALMOSHIELD**

Sets production records using domestic Palmoshield in place of imported palm oil

After tests covering a number of years, a leading steel company adopted Palmoshield as a replacement for palm oil in cold rolling operations. Recently over a run of 20 consecutive shifts, production was stepped up 15% over the average output with imported oil. This increase was made with no additional investment, no increase in labor force, no extra machines and no changes in mill operation. Yet 115 tons of steel were rolled for every 100 before.

Two Mill-Tested Benefits

Actual mill experience in dozens of plants has proven these advantages of Palmoshield:

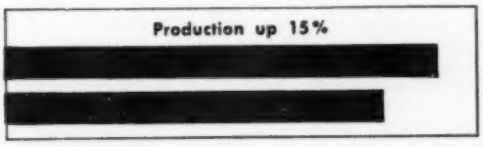
To Purchasing Agents. The price of Palmoshield is not artificially controlled. It rises and falls freely with the domestic fat market. Within the past year users have received several voluntary price cuts.

To Operators. Mill experience indicates that the use of Palmoshield improves production.

Palmoshield requires absolutely no changes in rolling mill operation.

Palmoshield makes steel quicker to gauge and shape.

Water break tests show that Palmoshield washes grease-free under conventional cleaning operations.



Quick Acceptance by steel producers

Nearly two-thirds of the major tin plate mills in this country and Canada are now using Palmoshield either in regular mill operations or for on-the-job-test runs. One company using Palmoshield for the first time was only 10 tons shy of the daily record. Another broke the single-shift record. And still another broke both 8-hour and 24-hour records.

4 Advantages of Palmoshield

Palmoshield is produced in the heart of the steel industry. Users are not dependent on overseas shipment.

Palmoshield is made from domestic materials freely available in sufficient quantities to supply all American steel production.

Palmoshield need not be stockpiled by the user, yet it does not deteriorate in storage.

Palmoshield is subject to exact chemical control. Free fatty acid content can be controlled to within ½%.

Can Palmoshield step up your production?

On request an Ironsides representative will give you facts on Palmoshield to help you set up a test program in your mill.

Palmoshield is available for same-day shipment in 55-gallon drums and tank car lots. For full information write The Ironsides Company, 270 West Mound Street, Columbus, Ohio.

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Host for A. E. S. 40th Annual Convention. June 15-18, 1953

In February, 1909, Charles Proctor called eight platers together at the old Astor House in New York City. This meeting saw the birth of a new electroplating society. Today two of the eight present at the first meeting are alive: Royal Clark and George B. Hogaboom. The following month a larger group attended a second meeting at which officers were elected and a name given to the organization; it was to be known as the National Electroplaters' Association, the NEPA. Charles Proctor was elected president.

There was an active response to the new organization and all over the country groups were formed. These were not Branches; all were members of the NEPA with New York as headquarters. Each group or region provided a vice-president for the association in New York. This system was established in March, 1909. On September 10, 1910 the first true Branch of the Association was formed in Philadelphia with F. C. Clement of RCA Victor as Branch President.

In February of 1913 each Branch sent delegates to a national reorganization meeting; at this meeting a constitution was drawn up and adopted, the name was changed to the American Electroplaters' Society and the A. E. S. was officially organized under its present name.

The first regular meeting place of the Philadelphia Branch was the Harrison Laboratories of the University of Pennsylvania. Use of the lecture room was kindly offered by Drs. Hiram Lukens and Edgar Fahs Smith. The Branch has been grateful to have the continued convenience of these facilities.

In the 42 years since the first meeting the Branch membership has grown to over 200 and, in the interim, has provided nucleus memberships for new Branches including the Baltimore-Washington, the Allentown-Reading, and the Lancaster Branches.

As the 1928 Philadelphia Branch President, George Gebling said on the occasion of the formation of the Baltimore-Washington Branch, "The Branch regrets seeing these friends leave but will actively support the formation of new branches to foster the interest of the electroplating industry through the increased society membership resulting from the formation of these units."

The Philadelphia Branch has been active in the educational field. In 1922 they sponsored and underwrote a series of lectures on elementary chemistry given every meeting night by Dr. A. K. Graham. In 1927 this was superseded by a fifteen-week course to instruct the plater in the then new volumetric methods of plating solution analysis.

In October, 1927 an electroplaters' class was held in a local high school. The first teacher was W. M. Scott (who died December 3, 1928). Al Hirsch taught the class for sixteen years and retired from teaching in 1944. Dr. Samuel Heiman, Edward Ottens and Charles Gross were also instructors. This course ran three years, 6 hours a week. This was replaced in 1949 by a shorter, college sponsored course which is currently being conducted at Temple University under the instructorship of Dr. Heiman.

Current practice of the Philadelphia Branch is to meet on the fourth Friday of the month; the meeting place alternating between the Harrison Laboratories and, for dinner meetings, various hotels or restaurants.

Two special meetings are held in the fall. On September 26 the Branch attended the George Gebling Memorial Lecture and Banquet. On November 22, it will hold the Annual Educational Session and Banquet, an affair noted for its outstanding speakers and as an excellent social evening. This is normally the big event of the year for the Branch. Planning and managing this meeting has given the members an excellent schooling for running the National Convention.

The present officers of the Branch and their affiliation are:

President: Alfred H. Pope, Pennsylvania Salt Manufacturing Company

First Vice-President: Edwin F. Ottens, Philco Corporation

Second Vice-President: William H. Trushell, Advance Specialty Company

Secretary: I. William Margovitch, U. S. Gauge Company

Treasurer: George M. Long, Aetna Electroplating Company

Librarian: Clarence E. Boeruckel, Reynolds-Robson Supply Company

Board of Managers: Robert L. Farren, Aetna Electroplating Company; Samuel Heiman, Philadelphia Rustproof Company; Paul Mentzer, Sr., United Specialties; Nat Verrelle, Philadelphia Manufacturing Company.

The personnel of the 1953 Convention committees will be listed at a future date. We would, however, like to point out that any correspondence can be directed to the General Chairman, Dr. Samuel Heiman, 5155 Westford Road, Philadelphia 20, Pa. Sam, who is Branch Past President, has his convention organization in high gear and one can tell from the way things are starting that the 1953 Convention will be well managed, interesting, and a success from both the technical and social standpoints. If we may drop hints: the outing alone will be worth the trip to Philadelphia, especially for members from the land-locked states.

It is already evident that for years to come the 1953 meeting will serve as the standard of excellence for American Electroplaters' Society Conventions.

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Book Review

DR. HAROLD J. READ

Professor of Metallurgy, Pennsylvania State College

PRACTICAL METALLURGY FOR ENGINEERS by the Research Staff of E. F. Houghton & Company, revised edition, 1952, 599 pages. E. F. Houghton & Company, 303 W. Lehigh Avenue, Philadelphia 33, Pa. Price $3.50.

Although this book has some interesting and valuable passages, it can hardly be regarded as a completely satisfactory textbook for the entire field of practical metallurgy, as indicated by its title. Those sections devoted to discussion of the heat treatment of steel and allied processes are clear, comprehensive and accurate. It is unfortunate that other parts of the book fail in one or the other of these attributes. There is ample evidence that the authors have been markedly influenced by their immediate background of industrial activity in a firm extensively interested in heat-treating processes and equipment.

Of the six hundred pages in the book approximately four hundred are devoted to heat treating or closely allied subjects. Although one cannot deny the importance of such operations, the authors' division of space magnifies the relative position of heat treating in metallurgy. It would certainly appear that a well-rounded presentation of the general field of metallurgy would call for a lesser proportion of heat treating and a fuller treatment of the many other important aspects of metallurgy.

There are many objectionable passages in the relatively short discussions of subjects in the field of chemical metallurgy. An outstanding example is to be found on page 73 where the authors have confused two processes for the recovery of magnesium. In the field of physical metallurgy there are also objectionable features, for example, the explanation of precipitation hardening of aluminum alloys on page 489 is one which has been abandoned many years ago. It is true that the "key" theory which is presented has the advantage of simplicity and vividness, but these advantages cannot justify its presentation when it is so well known that the theory is hopelessly inadequate. If it seemed to the authors that the presently accepted theory is too complex for presentation to their prospective audience, it would be better to state that an explanation of the phenomenon is beyond the scope of the book than to offer an explanation which is not correct.

In spite of these objections the book has a very definite value because of the excellence of the long and detailed sections on the practical aspects of heat-treating operations, equipment and techniques. It should serve well not only as a textbook but as a reference work for those who will be concerned with such operations.

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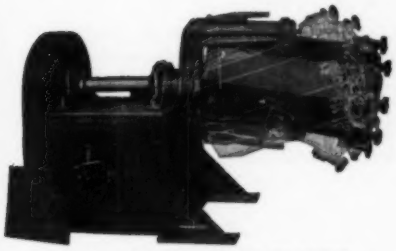

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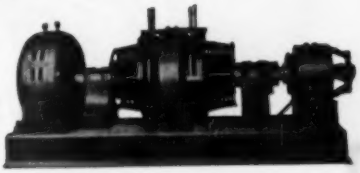

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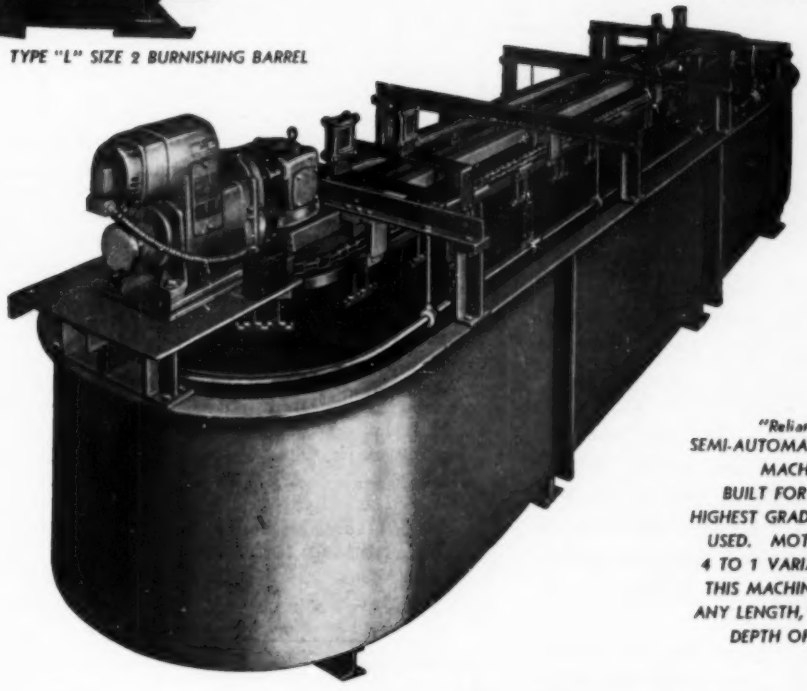

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Article Abstracts

No copies of articles are available at the offices of "Plating". Photostats may be had from libraries having files of the journal in question and offering photostat service, usually at 30-50 cents a page. Ask your public library to consult the Union List for names of libraries having the particular journal. Abbreviations used are those of Chemical Abstracts.

Surface Defects in Steel and Their Relationship to the Different Stages of the Manufacturing Process. T. Dennison. J. Electrodepos. Tech. Soc. 27, 35–44 (1951).

A description of the formation of mechanical defects in steel and how these defects appear in the finished hot- or cold-rolled sheet or strip. Surface finish records and photographs of defective surfaces are shown. A discussion follows.—*L. B. Sperry.*

Contribution to the Study of Electrolytic Polishing of Aluminum. J. Plateau, G. Wyon, A. Pillon, and C. Crussard. Metaux, Corrosion-Ind. **26,** 235-249 (1951). Met. Abstrs. **19,** 833 (Aug. 1952).

An experimental study of the mechanism of electrolytic polishing of pure aluminum, using Jacquet's perchloric acid-acetic anhydride (1:2) bath, is described. The bath when new may be suitably conditioned for polishing by addition of aluminum chloride or perchlorate. The optimum condition corresponds roughly to maximum viscosity and resistivity. The anodic products were isolated and shown to consist of a very viscous liquid and a white soluble product (anodic layer) containing aluminum chloride, chlorate, and perchlorate, which at 100° C attacks aluminum with evolution of gas. The heating effect of high current density is thus responsible for gassing at the anode.

Constant Level Device for Liquids. Dwight E. Couch and Abner Brenner. Anal. Chem. **24,** 922 (May, 1952).

A description of a new leveler that eliminates many

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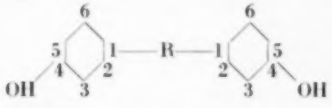
of the disadvantages of other types. It takes water directly from the tap, is of simple construction and is compact and easy to move from one bath to another. One leveler has been used on a 6-liter bath operating at 85° C and another has been used on a chromium plating bath of commercial size (3000 liters). Both have operated satisfactorily for several months. Although originally designed for laboratory use, the leveler may be used on large installations.

Recent Developments in Tin and Tin Alloy Plating. J. W. Cuthbertson. J. Electrodepos. Tech. Soc. 27, 13–22 (1951).

A general review of tin and tin alloy plating up to the present. Development has been very rapid in the last few years. The potassium stannate bath is faster than the sodium. In acid tin plating, the stannous sulfate-cresol-sulfonic acid bath has been superseded by the stannous sulfate-phenolsulfonic acid bath, which is much cheaper and has operating advantages. Another very successful solution is the patented Du Pont "halogen" bath. Another is the stannous fluoborate bath, which has not made such great headway. Acid baths must have an addition agent to refine the grain structure (except the stannous chloride bath). In the stannous and fluoborate baths, much success has been enjoyed with compounds having the structural formula:



Dihydroxydiphenylsulfone, in which R = SO_2, is one of the most successful.

Tin alloy plates in commercial use include copper-tin (speculum), tin-zinc, and tin-lead. Tin-nickel and tin-cobalt can be plated, as well as ternary alloys of tin-copper-zinc and tin-copper-cobalt.

In the discussion, it is brought out that tin-zinc plate can be satisfactorily phosphated for painting, or, better, passivated by dipping in a hot 2 per cent chromic acid solution.—*L. B. Sperry.*

Anodic Oxidation and Coloring of Aluminum. Bernard C. Lewsey. Electroplating **5**, 250–253 (August, 1952).

Aluminum anodized in chromic acid electrolyte by a modification of the Bengough process can be satisfactorily dyed to both pastel and deep colors and to black. In comparison with the finish produced by the normal sulfuric acid process, the chromic acid finish appears much more solid and more closely resembles enamel or high gloss paint. It is both attractive and durable and has been preferred to the more transparent sulfuric acid finish for certain purposes.

The author here describes his experience with the chromic acid process which he has operated on a production basis with completely satisfactory results.

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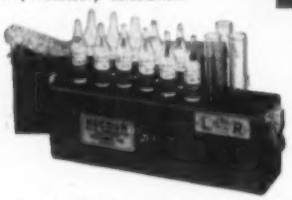
● The KOCOUR Chromic Acid Test Set was designed to accurately and simply determine the chromic acid content of chromium solutions. While a hydrometer is sometimes used for this determination, if close control is desired, the solution should be analyzed.

The set is self-contained . . . reads directly . . . is accurate to the one-half ounce per gallon of chromic acid . . . one simple subtraction is the only necessary calculation.



● Many platers use the KOCOUR Set "CR" for determining trivalent chromium in chromium solutions. The importance of this set is that a chromium solution high or low in trivalent chromium is not only expensive to operate but also is the cause of much spoiled work. The set is simple to operate . . . cost of upkeep small . . . no calculations are necessary.

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Patent Abstracts

GEORGE B. HOGABOOM
Consultant, New Britain, Conn.

Copies of patents may be obtained by writing to Commissioner of Patents, Washington 25, D.C. Price 25 cents each.

No. 2,600,699, June 17, 1952—Zinc-Copper-Tin Alloy Plating—Roy E. Shockley, assignor to R. E. Shockley, Inc., Kokomo, Ind.

CLAIM 1. The method of producing a corrosion-resistant plated surface on a platable article which comprises the steps of immersing in a bath comprising an aqueous solution of zinc, copper and tin salts, and containing an alkali cyanide and a caustic alkali, a cathode to be plated and an anode comprising an alloy of approximately 90 per cent zinc, 8.5 per cent copper and 1.5 per cent tin, and passing through said bath between said electrodes, a plating current, the metal components of said salts being present in the bath substantially in the proportions in which the corresponding metals are present in said anode.

CLAIM 2. The method of claim 1 in which, per gallon of water the dissolved substances are:

	Ounces
Sodium hydroxide	6.5–9
Sodium cyanide	3–13.5
Zinc cyanide	6.5–11
Cuprous cyanide	0.5–2
Potassium stannate	0.1–0.3

7 claims.

References cited: U. S. Patents 2,079,842; 2,435,967; 2,530,967.

No. 2,602,775, July 8, 1952—Electrodeposition of Zinc—E. I. Isherwood, assignor to Hudson Bay Mining and Smelting Company, Ltd., Winnipeg, Manitoba, Canada.

CLAIM 5. A process for the electrodeposition of zinc from a zinc-sulfate solution defined in claim 2, in which the amounts of silver, copper, cobalt and manganese respectively present in the alloy anode are within the ranges of from about 0.4 per cent to about 1.45 per cent silver, from about 0.15 per cent to about 0.45 per cent copper, from about 0.01 per cent to about 0.15 per cent manganese, and from about 0.01 per cent to about 0.02 per cent cobalt.

NOTE: Zinc-sulfate solution is not defined in Claim 2 or in legend.

6 claims.

References cited: U. S. Patents 1,681,272; 1,699,761; 2,419,722.

No. 2,603,595, July 15, 1952—Plating Thickness Meter—G. H. Rendel, assignor to United States Steel Company.

CLAIM 1. Apparatus for determining the amount of

metal electrolytically deposited on an elongated longitudinally moving article which comprises a first circuit for obtaining a potential proportional to plating current, a second circuit for obtaining a potential proportional to article speed, a polarity sensitive potential comparing device connected in both of said circuits for comparing the two potentials, a voltage divider in one of said circuits, a movable arm for said voltage divider, a series connection between said arm and the potential comparing device, and a reversible motor controlled by said comparing device connected to change the position of said arm to balance the potentials applied to the comparing device, the position of said arm indicating the plating thickness.

8 claims, 1 figure.

References cited: U. S. Patents 1,396,919; 2,325,401; 2,427,661; 2,473,918.

No. 2,606,147, August 5, 1952—Electrodeposition of Arsenic—A. E. Chester, assignor to Poor & Company, Chicago, Ill.

An arsenic plating bath may be used having the following composition:

1¾ ounces sodium arsenate
0.8 ounce potassium cyanide
1 quart water

These are boiled together for ½ hour, then filtered and used at a temperature of 167° to 176° F.

CLAIM 1. In a method of controlling the electrodeposition of arsenic from a sodium arsenate plating bath onto an electrically conducting object of a type in which arsenic would normally be deposited in greater concentrations in some areas than in others by a direct plating current; the step which comprises electrodepositing the arsenic by subjecting said object in a plating bath to a plating current having an asymmetric alternating wave form comprising an alternating current superimposed on a direct current in the ratio of 2 to 4 volts R.M.S. to 2.5 volts D.C., regardless of the specific current values, at current densities from 2 to 15 amperes (approx.) per square foot.

CLAIM 2. Comprising an alternating current to direct current ratio from 2 to 4 volts (approx.) R.M.S., alternating current having a frequency within the limits from 25 to 60 cycles (approx.) to about 2.5 volts D.C.

2 claims, 3 figures, 1 example.

References cited: U. S. Patents 2,443,599; 2,515,192. Electrodeposition of Metals—George Langbein, William T. Brant translation 1924, pp. 584–587. The Metal Industry—April 19, 1929, pp. 396–398; article by Cocks.

No. 2,606,866, August 12, 1952—Method of Treating Tin Plate—R. A. Neish, assignor to United States Steel Company.

CLAIM 1. In a method of treating tinned sheet material to inhibit the tendency to sulfide staining and

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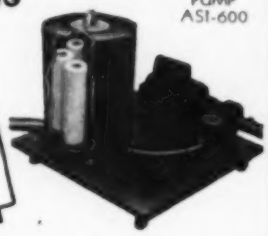

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baking discoloration and increase the adherence of lacquer, the steps including first making the material cathode in an acid solution containing from 0.2 to 3 per cent of a chromate of an alkali metal, and having a *p*H value of from 2 to 7, thereby at least partially reducing the oxide film initially existing on the material, and immediately thereafter making the material anode while still in said solution, thereby re-oxidizing the tin surface and forming thereon a water-insoluble protective film of a complex combination of the oxide and said chromate.

CLAIM 2. The method defined by claim 1 characterized by said solution containing an alkali-metal phosphate and a chromate aggregating about 3 per cent or less.

2 claims, 1 figure.

References cited: U. S. Patents 2,215,165; 2,312,076; 2,424,718; 2,450,509; 2,503,217. British Patents 416,608; 486,752.

No. 2,607,722, August 19, 1952—Electrolytic Polishing of Stainless Steel—J. F. Kreml, assignor to Armco Steel Corporation.

CLAIM 5. In the production of an electrolytically polished stainless steel product, the art which comprises, subjecting the metal to anodic treatment in an electrolytic bath by weight predicated upon anhydrous acids essentially consisting of about 20 to 70 per cent glycolic acid, about 15 to 55 per cent sulfuric acid, and about 5 to 30 per cent water, while maintaining a current density of approximately 0.5 to 1.0 ampere per square inch of the metal surface under treatment and a temperature of the electrolytic bath ranging between 80° C and 100° C.

CLAIM 12. The method of anodically polishing stainless steel articles which comprises electrolyzing the article as anode in an electrolyte of approximately the following composition:

Aqueous sulfuric acid (95 per cent by wt.)—8-43 per cent by volume.

Aqueous glycolic acid (70 per cent by wt.)—the balance to achieve a mirror-like polish on the article.

12 claims, 1 figure.

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Patent Abstracts

References cited: U. S. Patents 2,335,354, 2,382,865. Hackh's Chemical Dictionary, 2nd edition (1937) p. 526.

(NOTE: In claim 12 total volume is not given.)

No. 2,608,530, August 26, 1952—Electrodeposition of Metal Salts—M. Kahn, assignor to U. S. of America as represented by United States Atomic Energy Commission.

CLAIM. The process for quantitatively electrodepositing uranium fluoride from dilute aqueous solution of uranyl nitrate which comprises contacting at least two electrodes with a dilute aqueous solution of uranyl nitrate wherein concentration of sodium fluoride lies in the range of between about 25 times to about 300 times the concentration of uranyl nitrate and passing a direct current through said solution at a potential of about 7 volts and a current density at the cathode of about 0.6 ampere per square decimeter, whereby insoluble lower valent uranium fluoride is deposited.

1 claim, 4 figures.

References cited: U. S. Patents 571,531; 698,696; 1,050,796; 1,896,022; 1,912,430; 2,059,053; 2,081,121; 2,374,289. "The Electrochemistry of Uranium and the Single Potentials of Some Oxides of Uranium" by Pierie (1919), pp. 527–536. Journal of Physical Chemistry, Vol. 23 (1919), pp. 527 through 536. Chemical Abstracts, Vol. 31 (1937), p. 2115. A Comprehensive Treatise of Inorganic and Theoretical Chemistry by Mellor, Vol. 12 (1932), pp. 25, 26, 74, 75, 76 and 80. Textbook of Inorganic Chemistry by Friend, Vol. 7 (1926), part 3, p. 290. Electrolytic Oxidation and Reduction by Glasstone et al (1936), pp. 135, 137, 188.

No. 2,609,338, September 2, 1952—Electrodeposition of Cadmium—Tin Alloy—Russel D. Gray, Jr., assignor to Curtiss-Wright Corporation.

If a part to be provided with a corrosion resistant or preventive coating is designed for operation with only a small clearance relative to the thickness of said coating, then the thickness of the basis metal of said part must be made less than the overall thickness of said part by an amount approximately equal to the thickness of said coating. From the standpoint of the strength of said parts, therefore, the corrosion resistant coating deposited thereover should be as thin as possible. Even if a part operates with a large clearance of space, it is desirable that its corrosion resistant coating be as thin as possible since with a thin coating the part is lighter in weight and the coating is less expensive. Accordingly an object of this invention comprises the provision of a novel and simple method of plating metal parts with a thin coating having the desired degree of corrosion resistance.

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Patent Abstracts

Solution	*Concentration of a solution*	
Constituents	*Per cent*	*Quantity*
Cadmium fluoborate Cd $(BF_4)_2$	51.60	246.6 cc
Stannous fluoborate Sn $(BF_4)_2$	43.50	71.2 cc
Boric acid H_2BO_3		20 grams
Ammonium fluoborate NH_4BF_4		50 grams
Fluoboric acid HBF_4	42.0	60 cc
Phenol sulfonic acid $HOC_6H_4SO_3H$	70.0	2.5 cc
Processed Protein powder		1–2 grams

*p*H—3 to 5
Current density—100–350 amp per sq ft
Optimum—30 amp per sq ft
Anodes—Tin anodes 75 per cent; Cadmium anodes 25 per cent
Temperature—room
Alloy coating—17–35 per cent tin; 83–65 per cent cadmium

CLAIM 1. The method of electrodepositing a cadmium-tin alloy on a metallic body comprising the steps of immersing said body in a bath of cadmium fluoborate and stannous fluoborate having a *p*H of approximately 3 to 5 and having approximately 80 parts of cadmium to 20 parts of tin; immersing cadmium and tin electrodes in said bath, 75 per cent of the surface area of said being tin with the balance cadmium; and a source of electric current for current flow through said bath in a direction such that said electrodes constitute anodes and said body constitutes a cathode.

6 claims, 1 example.

References cited: U. S. Patents 2,093,031; 2,397,522. Mathers et al., Transactions Electrochemical Society, Vol. 25 (1914), pp. 303, 327–331. Carlson et al., Monthly Review—American Electroplaters' Society, Vol. 33 (March, 1946), pp. 255–260.

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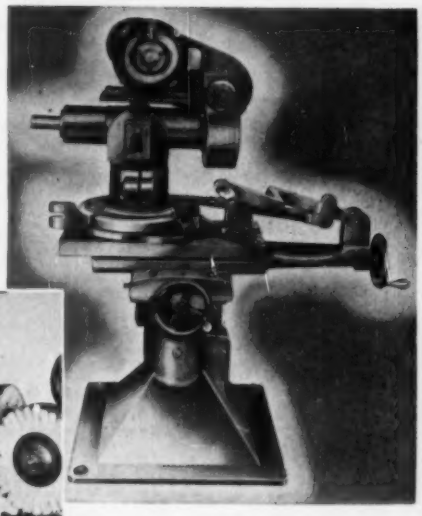

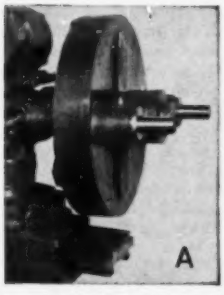

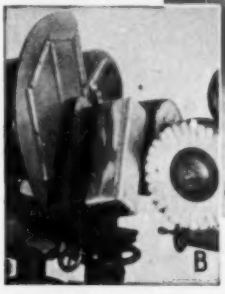

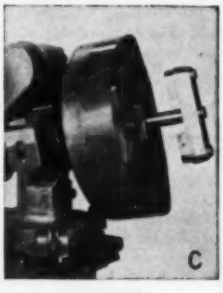

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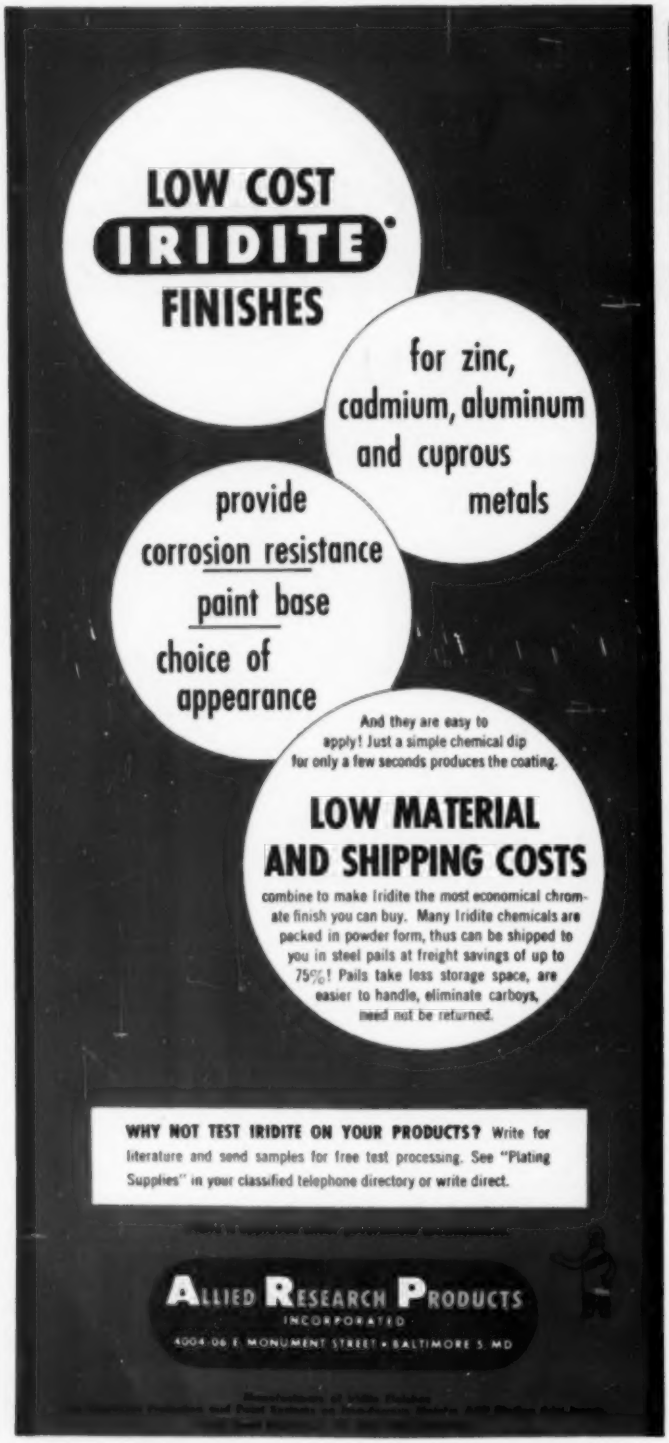
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A.E.S News

Annual Meetings

Annual Meetings seem to follow a pattern as unvaried as a Hoover postage stamp. The boys get together for a little beer or such, a good meal and some entertainment for the wife, and a little education. The education is usually clinical (and sometimes confessional) dealing with subjects like "How To Prevent Nickel Peeling on Shoe Button Hooks" or "How To Refinish Aunt Ella's Antique Shaving Mug".

The point is that they are seldom inspirational, and if anyone drives 300 miles to attend he is in bad need of companionship or he really missed the boat on Aunt Ella's Shaving Mug.

We feel that the educational sessions of Annual Meetings should suggest new markets and new profits to you if you are a shop owner; they should call your attention to unexplored fields if you are a technical person; and they should remind you that there are greater opportunities than wire dunking if you are an operator. They should stimulate your initiative and improve your way of life by encouraging you to act the full limit of your ability.

That is the kind of an Annual Meeting we would drive 300 miles to attend.

L. D.

This editorial in the *Newsleaf* of the Milwaukee Branch is pertinent as many Branches plan their Annual Meetings. We thought the membership should see it.

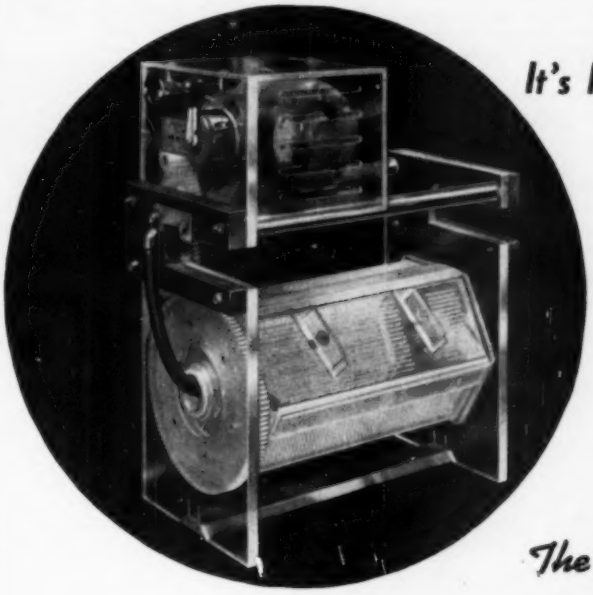
Sustaining Members

The following organization has joined the ranks of sustaining members whose dues go to support of A. E. S. Research.

The Plating Institute of Michigan, Detroit 26, Mich.

OBITUARY

✣ **Mr. Frank Clark,** Honorary Member of the A. E. S., passed away on Sunday, September 28. Mr. Clark had been active in the plating industry for over thirty years, and in the A. E. S. almost as long. He represented Zucker, Levett and Loeb, Munning and Loeb, and Hanson-Van Winkle-Munning Company in the New England area prior to retiring in 1948 when he moved to Dunellen, N. J. A host of friends mourn his passing.



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Branch News

Coming Events

PHILADELPHIA BRANCH

ANNUAL EDUCATIONAL SESSION AND BANQUET

Saturday, November 22

Educational Session at 1:30 P. M.

DR. R. B. SALTONSTALL, Technical Director, Udylite Corp., "Nickel Plating—Today and Tomorrow"

MR. EDWIN F. OTTENS, Chemical Engineer, Philco Corp., "Practical Aspects of Zinc and Cadmium Plating"

DR. W. L. MCCRACKEN, Director of Research, Detrex Corp., "Periodic Reverse and Ultra-Sonic Cleaning"

Banquet at 7:00 P. M.

SAMUEL HEIMAN, *Chairman,*
Publicity Committee

BUFFALO BRANCH

On the last meeting before the Summer, held May 2, 1952 at the Hotel Markeen, Buffalo, a business session only with election of officers for the year 1952-1953 was conducted.

The following officers were elected:

President—ANTHONY NIGRO

First Vice-President—JAMES MONEYPENNY

Second Vice-President—WILLIAM FOTHERINGHAM

Third Vice-President—LEON NOWAK

Secretary—BEN FORTIN

Treasurer—STANLEY BUSH

Librarian—DR. A. JANIS

Sergeant-at-Arms—ROBERT BURFORD

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BEN P. FORTIN, *Secretary*

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CINCINNATI BRANCH

The Cincinnati Branch opened the 1952-1953 season with a very healthy turnout on September 24 for both the usual tasty dinner and the business meeting which followed. We were extremely happy to welcome seven guests from the local Ford Motor Company's Automatic Transmission plant who, we hope, will be active members of our branch.

PRESIDENT ROBERT D. MILLER opened the meeting by introducing our various guests and then brought to the membership's attention the new charges which will be made for the use of our meeting place, the Engineering Society of Cincinnati's Headquarters. It was felt that it would be advisable for a committee to study this matter, and accordingly CHARLES T. NUZUM was appointed as Chairman with MESSRS. RICHARD EVANS and JOSEPH LUDMAN as other members of the committee.

Since the Librarian elected in March had left Cincinnati, it was necessary to appoint a successor. The nominating committee, after lengthy and diligent search, brought in the name of CHARLES R. SORRER who was unanimously elected to perform this most important function.

A discussion was then led by CHARLES WISE on the possibility of a Regional Educational Meeting and Dinner Dance in Cincinnati to be held after January 1. The costs of a meal, orchestra, floor show, waiters, etc., were presented as well as the contributions which could be expected from suppliers. HARVIE JOHNSON of Belke Manufacturing Company, Chicago, felt that they could be asked for $25.00. Mr. Wise was asked to ascertain when Dayton and Indianapolis would hold their meetings after which DEL TAYLOR moved, seconded by R. EVANS that we hold such a meeting.

The Secretary presented the Membership Transfer of ROGER SLATER from Grand Rapids. Then he offered his letter of September 8, 1952, addressed to the Board of Directors of the A. E. S., Branch Secretaries and Exhibitors asking that the annual conventions be changed to Spring or Fall so that cooler weather would be experienced. Mr. Wise moved that the Branch go on record as favoring this recommendation which was seconded by MARTIN GANNON, and passed.

We were then shown some unusual pictures of World War II which were presented by Harvie Johnson whose Belke Manufacturing Company then were hosts for our regular Social Hours.

CHARLES WISE, *Secretary*

DETROIT BRANCH

The meeting was called to order by PRESIDENT H. E. HEAD, on Friday, September 5, 1952, at 8:15 P. M. in the Hotel Statler—Michigan Room.

Eight new members were unanimously elected into the branch. Two members

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were transferred to Detroit from other branches.

Progress reports were made by members of the Membership, Research, December Party, and Stag Day Committees. Delegate Walter Pinner reported that Bill Phillips has been made an honorary member of the Society. Mr. Pinner also discussed other important business conducted at the Business Meeting of the recent National Convention.

After the showing of a new movie, "Jet Story" which told of the manufacture of jet engines by the General Electric Company, Educational Chairman Fred Wagner turned the meeting over to the principal speaker, Mr. Fred Kraatz, Technical Service Manager of the S. C. Johnson Company, Racine, Wis. Mr. Kraatz's subject was "Protective Wax Coatings in Industry" which covered the application of wax coatings to painted, plated, and bare metals for corrosion protection.

A lively discussion period followed, in which problems related to coatings on aircraft, spark plugs, plated parts, munitions, and other manufactured items were covered.

Refreshments were served following adjournment of the meeting.

Ed Kubis, *Publicity Chairman*

GRAND RAPIDS BRANCH

The Grand Rapids Branch held its first meeting of the current season at Finger's Restaurant, where 65 members were served an excellent country style meal.

The business meeting was called to order by President Jack Hanney, who asked each person present to stand and give his name and company affiliation. Two new applicants were presented to the branch: Mr. Curtis Boos, Lear, Inc., and Mr. Russell Fancher, Wyandotte Chemicals, Inc. The president then asked the members how they wished to have the branch delegates vote on the Chicago proposal, which would raise dues one dollar. The additional dollar would be used for research.

Because our Branch for several years has contributed this additional dollar to the National Society, Maurice Caldwell made a motion that the delegates be instructed to vote "yes" on the proposal. The motion was supported and carried.

The next order of business was the deciding of where and how future meetings should be held. Mr. H. John Howell made a motion that all meetings be dinner meetings. The motion was seconded and carried. Mr. Paul Waalkes made a motion that the cost for the dinner be $3.00 with the Branch furnishing refreshments after the meeting. The motion was seconded and approved. Mr. Orvel Hoxie made a motion that the executive group be empowered to decide where the meetings should be held. The motion was supported and carried.

President Jack Hanney then turned the meeting over to Librarian Lyman Sperry, who introduced Mr. Earl De Noon, owner and operator of South Florida Test Service of Miami. The title of his talk was "Tomorrow's Products Tested Today". By the use of excellent 35mm. color film slides he showed the testing of plated parts, textiles, plastics, rubber products, and painted finishes. The facilities for inland, salt atmosphere, tidewater, and total immersion testing, as well as many special tests such as the termite cabinet, were shown. The great diversity of products tested at the South Florida Test Service proved to be an eye opener to everyone present.

The Miami area has 1,743 hours of ultra-violet sunlight per annum as compared to 540 hours in Chicago. This is one of the reasons for the rapidity of failure in South Florida.

Mr. DeNoon received a rising vote of thanks for his excellent presentation. A social hour with beer and pretzels concluded the evening.

Carl E. Green,
Publicity Chairman

HARTFORD BRANCH

A meeting was held at the Bond Hotel on September 15 and 53 members and guests were present. Preceding the meeting a color film produced by the duPont Company entitled "A Story of Research" was shown. Following this movie Mr. George Hogaboom mentioned the various literature that may be obtained free on plating from many companies.

The guest speaker of the evening was Mr. F. P. Spruance, Jr., of the American Chemical Paint Company, Ambler, Pa., whose subject was "The Alodine Process". He stated that most treatments given aluminum are for the purpose of increasing its corrosion resistance and this is accomplished by chemical treatments which increase paint adhesion. Various methods were discussed and compared such as anodizing from chromic and sulphuric acid baths, alkali chromate dips such as Alrok, phosphoric acid detergents which leave a phosphate film and the Alodine 100 and 600 processes. Advantages over anodizing were pointed out such as: lower equipment cost, lower labor cost, work is done in baskets, use of low temperatures, and good corrosion resistance. Many slides were shown on tests run on the coatings to illustrate their comparative corrosion resistance.

The technical chairwoman was Mrs. Julia Madzik and refreshments were served through the courtesy of the N. Apley Austin Company and Apothecaries Hall Company.

Stanley Platoz, *Secretary*

INDIANAPOLIS BRANCH

Twenty-eight members and one guest enjoyed a steak dinner on September 3, 1952 at Fox Steak House. The business meeting was then called to order by Branch President Don Patrick at 8:00 P. M. with 5 additional members present. The Secretary read the minutes of May meeting, the Treasurer gave his report, and Ed Bruck gave a report of the National Convention at Chicago.

Our President reported on the planning meeting and stressed the membership drive which will be under the direction of Al Kreise. We are initiating the hostess idea of selling tickets for the meal before the meeting and hope it will be successful. Plans are being made to publicize the organization and a campaign is being made to talk before civic and business groups. It is hoped to obtain radio and television time.

Bert Hawbee, Librarian, introduced Mr. Robert Stone who gave a very interesting talk on electro-spray painting. He also showed a color film of the process. The membership participated in the program and many questions were asked by the group.

Mr. John Lockerbie of Goshen was present and extended an invitation to attend the St. Joseph Branch picnic on September 13 at Lake Wawasee.

The meeting adjourned at 10:00 P. M.

Edna Rohrabaugh, *Secretary*

LANCASTER BRANCH

The first Fall meeting of the 1952–1953 season of the Lancaster Branch was held September 12, 1952 at the Hanover Country Club. Thirty-eight members and guests enjoyed a lobster tail dinner.

The Branch voted to instruct their delegates to vote in favor of the proposed change of the annual dues.

Harry L. Hovis, Chief Chemist of the Hamilton Watch Company, was appointed to serve on the committee of the Philadelphia Branch arranging for the 1953 Convention.

After other routine business was taken care of, President Fordney turned the meeting over to the Librarian, Arthur Arsenault, who introduced the speaker, Mr. J. W. Hensley, of the Research Division of Wyandotte Chemicals Corporation, who spoke on "Radioactive Tracers in Metal Cleaning Research".

Mr. Hensley first gave a brief summary of radioactive material, and then described the method used in tagging the soil with radioactive material. The soil used in the majority of his research was stearic acid synthesized with Carbon 14. In his research it was necessary to develop a method of obtaining identical finishes on the metal test pieces, and then applying the same amount of soil on each piece. The amount of radioactive material was measured before any cleaning procedure was tried and after cleaning; in this man-

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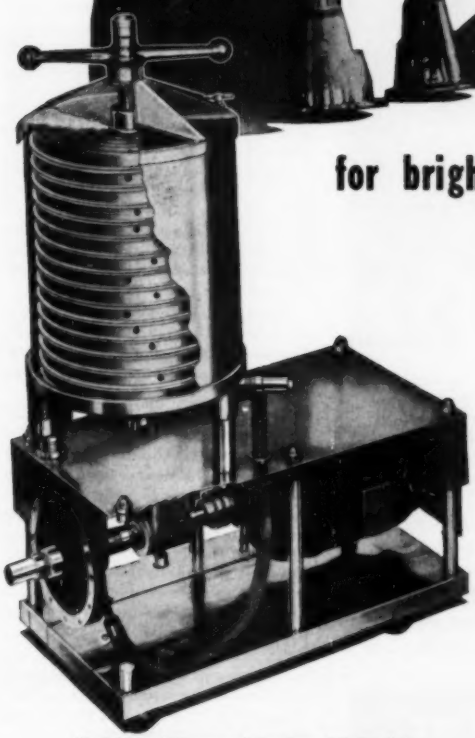

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ner it was possible to determine how much of the original soil was removed. Even though this work is only in the research stage, it is felt that the method will be of considerable value in evaluating cleaners.

After Mr. Hensley answered a number of questions, the meeting was adjourned.

MELBOURNE BRANCH

The 73rd regular Branch meeting held on 18 September, 1952 was attended by 60 members and visitors at Melbourne Technical College. Prior to the opening of the meeting, some interesting films were screened.

The speaker for the night, Mr. H. Merton, our President, was introduced to the members by the Librarian, Mr. Teague.

Mr. Merton's address was "Barrel Burnishing of Zinc Base Die Castings", in which he traced the history of barrel finishing from the days of rolling barrels around the floor to the present day design of hexagonal and cylindrical barrels. The practice of barrel work has become a tool of trade, with three main operations: deburring, burnishing and colouring or honing. A saving of up to 80 per cent has been achieved against wheel operation, and unskilled operators can operate a line of barrels, all producing thousands of articles.

Practical experience was related by Mr. Merton on use of tumbling chips and grinding paste, much thought being given to ration of chip mass to work in barrel loading. Samples were shown of hardware in various stages of finish, and a most interesting and informative film was screened of barrel work and final plating operation taken in a Melbourne production plant.

After questions were put to the speaker by members, Mr. J. Parker thanked Mr. Merton for his lecture and for the tremendous amount of preparatory work put into the lecture. The meeting closed at 9:55 P. M. with the President thanking Mr. Glen Walker for time and expense incurred in making the technical film.

S. B. Pearce, *Secretary-Treasurer*

PITTSBURGH BRANCH

The Pittsburgh Branch held its first meeting of the year at the Sheraton Hotel on September 11, 1952. A group of 25 members enjoyed a particularly delicious fried chicken dinner prior to the business meeting at which 42 members and guests were present.

The various officers gave their reports on the activities which took place during the summer and the progress of the activities which are being planned for this year.

Treasurer Damon Antel informed us that we still have 21 delinquent members, and President Rex Goldbach urged that all delinquents should make an effort to pay their dues since it is unfair for the balance of the Branch to pay the per capita tax for these delinquents.

Librarian G. S. Woodruff read the list of speakers and subjects for the year and everyone present agreed that the subjects to be presented form a well-rounded program.

Membership Chairman Bob Varner has asked the entire Branch to serve on his committee. It is the duty of every member to be as active as he possibly can in Branch activities. If every member brought a new man into the organization the results are quite evident.

Three new members were welcomed into our Branch. They are: Harry L. Flister, Wyandotte Chemical; W. F. Pizoli, Oakite Products; and Charles Galba, Gogals Modern Products Company.

Glenn Herring, chairman of our Milwaukee night, has investigated a number of possible places to hold our party. After the merits of the various hotels were discussed, it was decided to hold the party at the Fort Pitt Hotel on the second Saturday of November. This date, as we all realize, is a little early for a holiday party but we have discovered in the last few years that the weatherman does not cooperate with the Pittsburgh Branch at their December parties.

Sam Johnson gave a brief report of the Chicago convention at which approximately 55 of our members were present. It was quite apparent that the convention was a considerable success.

Librarian asked one of our guests, Dr. A. K. Graham, to introduce our speaker since Dr. Graham has been a close friend of the speaker for years. Maurice R.

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Branch News

CALDWELL of the Doehler-Jarvis Corporation, Grand Rapids, Mich., presented an interesting talk on "Comparative Protection Obtained by Various Thicknesses of Copper and Nickel Upon Zinc, Aluminum and Magnesium Die Castings". The speaker showed test panels which had been plated by various methods and that had been given exposure tests at Detroit, Pittsburgh, Miami and Grand Rapids. By the use of slides, Mr. Caldwell was able to show the advantages of various combinations over different alloys. The following factors were most prominent in affecting the rate of corrosion: (1) Base-metal chemical composition, (2) thickness of plate, (3) atmosphere. A very interesting question period followed the main lecture and the number of questions presented plus the manner in which they were answered was most indicative of a successful technical session. The members enjoyed themselves after the meeting by partaking in refreshments and informal discussions.

R. H. SCHINDLER *Secretary*

PROVIDENCE-ATTLEBORO BRANCH

The Providence-Attleboro Branch of American Electroplaters' Society held their first meeting of the season on September 15, 1952 at the Providence Engineering Hall.

The speaker, DR. F. A. LOWENHEIM, director of Electro-Chemical Research at the research laboratory of Metal and Thermit Corporation, was introduced by the PRESIDENT, FRANK W. BOATHROYD.

A very interesting and technical description of tin zinc alloy plating was given. A discussion period followed, led by Dr. Lowenheim.

The meeting was adjourned at 10:30 P. M.

G. A. GIBBS, *Secretary*

ROCHESTER BRANCH

The September Branch meeting was called to order by PRESIDENT JOHN LENZI on September 15, 1952 at 8:15 P. M. The meeting was held in the classroom at the Rochester Products Division, General Motors Corporation, Lexington Avenue plant. During a short business meeting the Secretary outlined the meetings of the Board of Managers and Officers held during the Summer. Announcement was also made of plans for the coming year.

Following the business meeting, a tour was made of the plating and assembly departments of this large modern plant which supplies locks, cigarette lighters, carburetors, etc., to other General Motors Divisions. The tour was arranged for by JOHN ADAMS, Supervisor of Plating at the plant, and conducted by Mr. Adams and several assistants who guided small groups. The Rochester Branch sincerely appreciated this opportunity and enjoyed seeing this modern plant.

E. WALLIN, *Secretary*

ROCKFORD BRANCH

The Rockford Branch of the American Electroplaters' Society held its opening Fall meeting September 8 at the Hotel Faust. There were 35 on hand for dinner and 43 for the lecture.

Branch PRESIDENT DALE CHAPMAN opened the meeting with a hearty welcome for the coming year.

DAVE STOCKTON discussed the arrangements for the October meeting to be held at Juls Restaurant in Sterling, Ill. The meeting is being held there to stimulate the interest of people in the Tri-City area in the American Electroplaters' Society. The Rockford members will leave by bus from Rockford to Sterling in order to be there by 7:00 P. M. The speaker for our October meeting will be DR. SALTONSTALL of Udylite Corporation.

LIBRARIAN BILL GEISSMAN introduced the speaker of the evening, MR. RUSS HARR of Western Electric, whose subject was "Materials for Plating Room Construction". The subject was well covered and involved the floor, tanks, air exhaust systems, plumbing and drains and storage tanks. There was an interesting discussion period that followed with many questions and explanations of previous experiences by members in the audience. It was pointed out by Wm. Geissman that the information in the talk by Harr was an accumulation of many hours of study, records and trials and was of great value to everyone.

KENNETH KIESELBURG,
Secretary-Treasurer

SAGINAW VALLEY BRANCH

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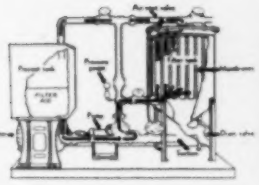

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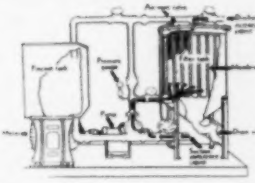

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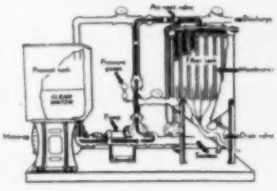

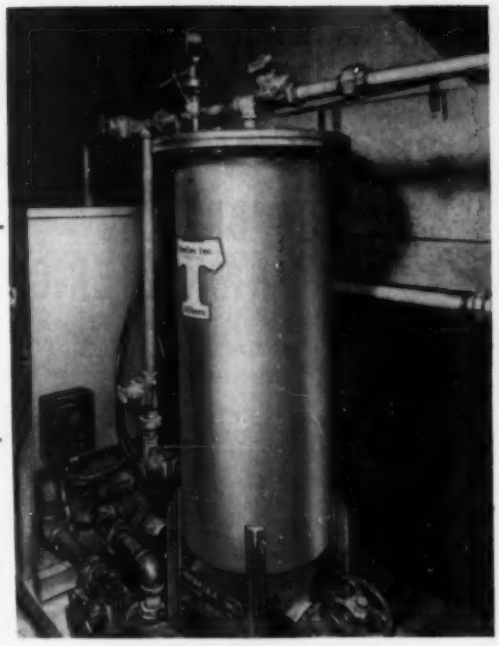

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Branch News

off to a fine start September 9, 1952, when 48 members and guests met at Zehnder's Hotel in Frankenmuth, Mich.

After a wonderful chicken dinner, the meeting was called to order by PRESIDENT L. J. MIMMIOLE who was happy to say that our Stag Day, July 12, 1952, was a huge success and thanked everyone concerned.

Three new members and one transfer were voted into the Society: MR. A. G. METTE of Chevrolet, Flint; MR. E. E. CHALETTE of Bay City, and MR. CHARLES VERT of A. C., Flint; MR. G. P. BEARDSLEY of A. C., Flint, transfer from the Milwaukee Branch.

After the business meeting, LIBRARIAN E. A. BRISSON introduced the speaker for the evening, MR. GEORGE HARDING of the Harding Manufacturing Company of Detroit, Mich.

Mr. Harding entertained us royally with his own movies taken in various parts of the United States and he was invited to come again whenever he could spare the time.

A door prize, donated by MR. VAL JONES of Duggan Masking Devices, was won by MR. GODDEYNE of the Goddeyne Manufacturing Company.

D. WILLIAM SNYDER,
Recording Secretary

SAN FRANCISCO BRANCH

A regular meeting, with 29 members and visitors attending, was held at the El Curtola Restaurant, Oakland, Calif., August 14, 1952, following a call to order by J. R. PATTENGER, Branch President, at 8:30 P. M.

THOMAS T. JOHNSON, JR., JOHN V. LYDDANE and JACKSON MOFFETT were elected to membership during the course of a routine business meeting.

As a result of a discussion by the membership the following were listed as subjects of most interest at this time—to be used as a guide in program arrangements.

1. Hard Chrome Plating
2. Cutting Cost of Supplies
3. Trouble Shooting
4. Brass Plating

Speaker for the evening, C. R. MACDONALD of C & M Plating, gave a very interesting talk on acid pickles and dips before plating, including special fluoboric acid dips for specific uses. Mr. MacDonald will submit an outline of his talk to the Secretary who will make it available to the entire membership.

The meeting adjourned at 11:45 P. M.

HORACE J. SMITH,
Secretary-Treasurer

SOUTHEASTERN BRANCH

A regular monthly meeting was held at the Georgia Hotel on September 12. The meeting was called to order at 9:30 with

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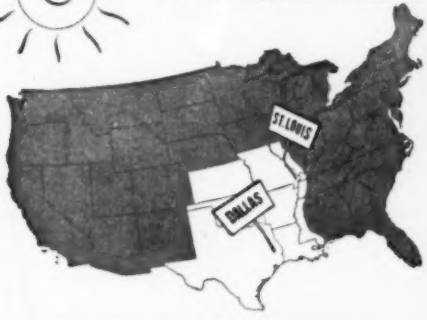

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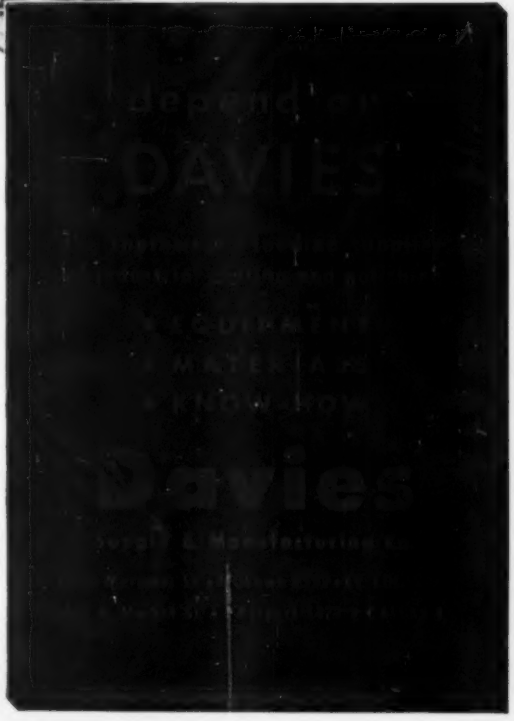
- ALMCO DIVISION, QUEEN STOVE WORKS

—and many others



Branch News

14 members present, M. E. Awtrey presiding.

Due to our Second Vice-President, Baynard B. Smith, moving east to accept a better position, we were called upon to elect a member to fill his vacancy. Our good friend and member, Cyrus N. Shearer of La Grange was the choice unanimously.

The balance of the evening was spent in preparation of our October meeting which is to be held on Friday, October 10, 1952 at the Signal Mountain Country Club, Chattanooga, Tenn., Mr. Ray Charles Steffey to handle the arrangements, invitations, etc. C. H. Hohner of Udylite Corporation will act as M.C.

The meeting adjourned at 11:00 P. M.

W. T. Weymouth,
Secretary-Treasurer

SYDNEY BRANCH

The 86th general Branch meeting was held at the Trust Building, King and Castlereagh Streets, Sydney, with an attendance of 17 members.

The meeting was held on September 4, 1952, a week earlier than usual so as to coincide with the visit of Mr. R. Keller to Sydney. Mr. Keller is now teaching at the Caulfield Technical School, but before that was connected with the Defense Research Laboratories, Victoria, where an appreciable amount of research was carried out on plating on aluminum.

Mr. Keller gave his very interesting and informative talk on his subject, relating from time to time of the experiences he had when connected with D. R. L. Many methods were mentioned including direct plating on aluminum but the most successful way seems to be with the zincate process. One experiment carried out with this process was hard chromium plating of aluminum cylinders on which was plated .002 inch copper, .004 inch nickel, and .017 inch chromium which after a total running time of 125 hours was found to have stood all tests required.

Mr. Keller then went on to talk about the results and methods of porous chromium plating which is necessary in plating of cylinders. Several articles were passed around the meeting to demonstrate the advantages and disadvantages that could be gained.

After many questions had been answered a vote of thanks was then given to Mr. Keller for his very fine and interesting talk.

B. Bridgement,
Secretary-Treasurer

1952-1953 Branch Speakers' List Additions

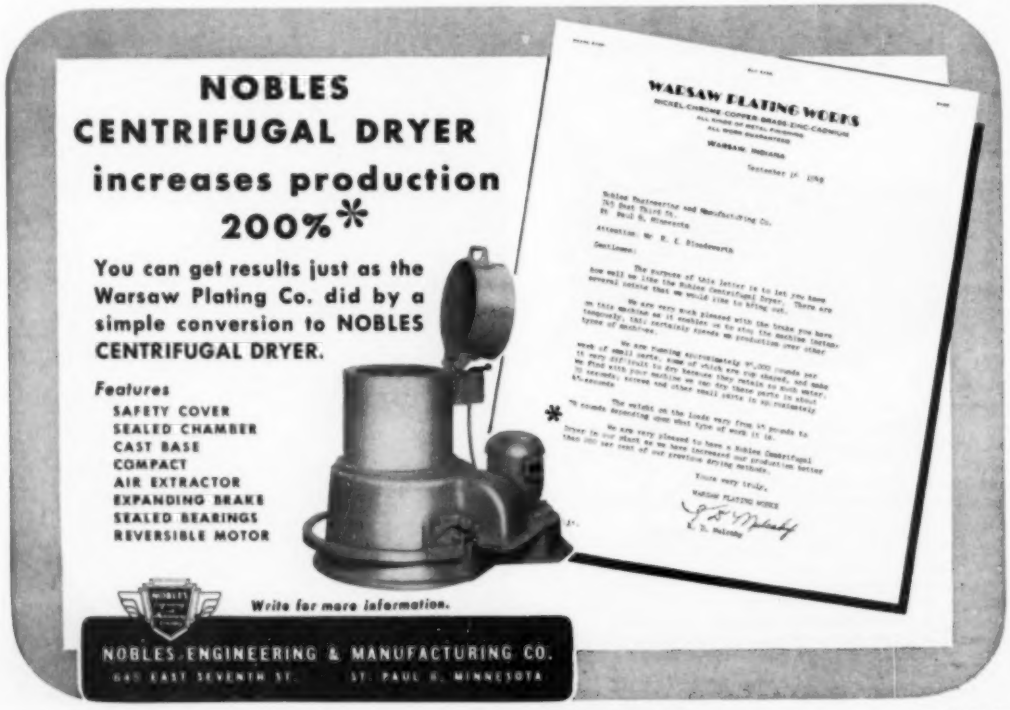
AMERICAN AGILE CORP. (c)
P. O. Box 168, Bedford, Ohio—Any Branch
Mr. J. L. Huschier, Technical Director
Subject:
Use of Plastics in PLATING Equipment

ATLAS MINERAL PRODUCTS CO. (c)
Mertztown, Pa.—Any Branch
Dr. Raymond B. Seymour, Executive Vice-President; Dr. Robert Steiner and Earl A. Erich
Subject:
The Use of Plastic Materials in the Plating Industry

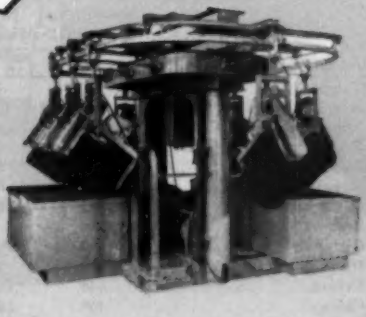
OAKITE PRODUCTS, INC. (c)
Rector Street, New York, N. Y.—Any Branch
Dr. Donald Price; Gerald Lux and Martin Maher
Subject:
Varied subjects in the cleaning field

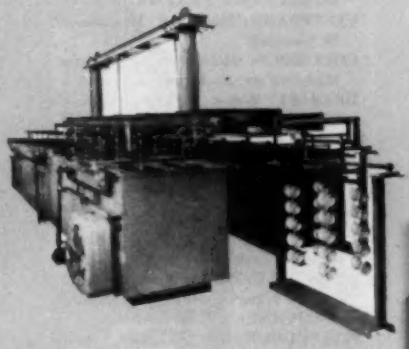
POOR & COMPANY, PROMAT DIVISION (c)
851 S. Market St., Waukegan, Ill.—Any Branch
A. E. Chester, Director of Research,
Subject 1

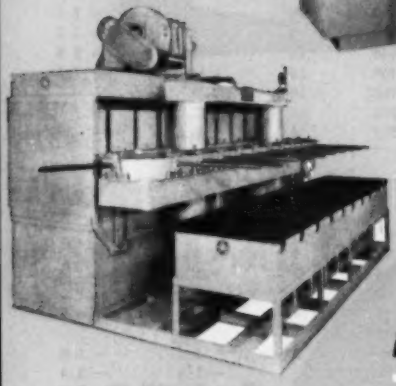
(*Continued on page 1278*)



CROWN AUTOMATICS



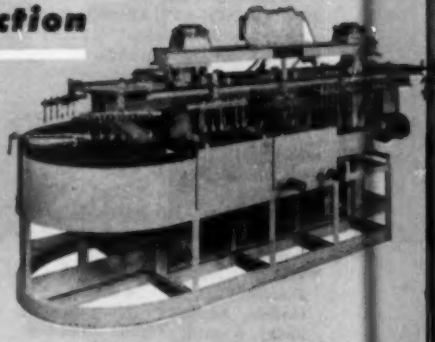


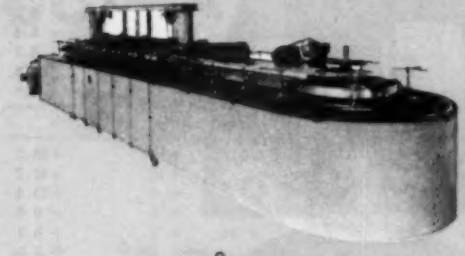


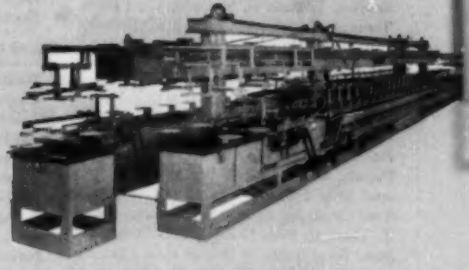
increase production

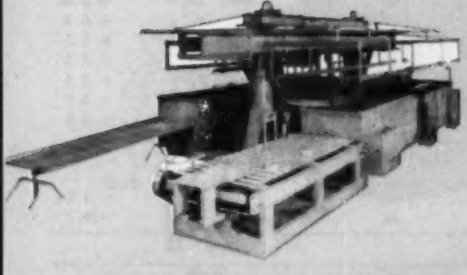
reduce costs

improve quality









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Membership Report of the A. E. S.

Elections

BRIDGEPORT: William F. Gillette, Michael S. Otes, James Whyte, Jr.

CLEVELAND: Michael F. Hodnick, D. M. Overcash

COLUMBUS: Halvor S. Christianson, Michael Farr, Jr., Lawrence E. Noll

DETROIT: Walter B. Byers, Virgil C. Coffman, B. E. Drury, Jr., Harlan W. Felsner, Richard Gray, Robert E. Hamilton, Carl J. Jackson, Mitchell I. Kafarski, Arthur E. Schneider, Paul Spencer

HARTFORD: Paul E. Hamel

JACKSON-LANSING: J. Dusty Rhoades, Leonard Reiman

LOUISVILLE: William W. Francis, Norman W. Johnson, Kenneth C. Reifsteck

MELBOURNE: S. E. Butler

PITTSBURGH: Harry L. Flister, Charles Galba, W. F. Pizoli

PROVIDENCE-ATTLEBORO: Richard C. Ashley, John Gaboury

SAGINAW VALLEY: Hulin G. Augsbury, M. Bryce Dabler, Carleton E. McNeuly, Donald E. Shearer

SAN FRANCISCO: Thomas T. Johnson, Jr., John V. Lyddane, Jackson Moffett

SOUTHEASTERN: A. J. Curry

SYRACUSE: Harry F. Watters

TWIN CITY: Stanley S. Cady

WESTERN ONTARIO: Ives W. Dagneau, G. J. Hodgkinson, Joseph Scislowski

WICHITA: Bert E. Dawson, John W. Dawson, Floyd M. Flanders, Royal L. Graham, Adolph R. Hune, Arvid A. Melby, Kenneth O'Brien, Edward M. Selwert, William G. Simpson, Cecil O. Thompson, Clifford L. Thompson, Donald Van Berchtold

Reinstatements

SOUTHEASTERN: Joseph A. Wilkosz

Transfers

Roger Slater to Cincinnati from Grand Rapids; James J. Keers, Jr., to Cleveland from Syracuse; Kenneth Greene from Cleveland to New York; Stephen E. Timmons from Columbus to Cleveland; King Rubly to Detroit from Chicago; Russell Fancher from Detroit to Grand Rapids; Harold Grutter from Grand Rapids to Toledo; Roger Slater from Grand Rapids to Cincinnati; William Laletin from Newark to New York; Fred Nobel from Newark to New York; Gustaf Soderberg from Philadelphia to Member-at-Large; Joseph H. James from Philadelphia to Baltimore-Washington

Resignations

CLEVELAND: John T. McQuillin

COLUMBUS: N. G. Lyle, J. E. McCarthy, F. W. Pinkerton, C. J. Slunder, J. Withrow, J. C. Zelein

Membership Competition

BRANCH	Membership Apr. 1, 1952*	New Members	Net Change in Membership	Per Cent Net Change
First Group				
Toronto	132	7	+ 7	+ 5.3
New York	305	17	+14½	+ 4.8
Milwaukee	145	8	+ 5½	+ 3.8
Bridgeport	154	3	+ 3½	+ 2.3
Pittsburgh	132	8	+ 3	+ 2.3
Newark	240	6	+ 2½	+ 1.0
Grand Rapids	155	3	+ 1	+ 0.6
Boston	140	..	.....	.....
Cleveland	212	12	− 3½	− 1.7
Hartford	148	3	− 2½	− 1.7
Detroit	500	11	−11½	− 2.3
Chicago	469	28	−19	− 4.1
Melbourne†	168	16	−11	− 6.5
Los Angeles	218	1	−15½	− 7.1
Philadelphia	203	4	−20	− 9.9
Second Group				
New Haven	88	6	+ 7	+ 8.0
Saginaw Valley	71	4	+ 4	+ 5.6
Cincinnati	80	4	+ 4½	+ 5.6
Montreal	72	4	+ 3	+ 4.2
Baltimore-Washington	96	3	+ 2½	+ 2.6
Rochester	88	9	+ 2	+ 2.3
Buffalo‡	107	4	+ 1	+ 0.9
St. Louis	102	..	.....	.....
Syracuse	104	7	− 1	− 1.0
Waterbury	115	..	− 1½	− 1.3
St. Joseph Valley	74	2	− 4	− 5.4
Providence-Attleboro	92	4	− 6	− 6.5
Sydney	86	2	− 7	− 8.4
Indianapolis	114	3	−10	− 8.8
Dayton	81	3	− 7½	− 9.3
Rockford	79	3	−15	−18.9
Third Group				
Wichita	...	12 (19)	+12	+63.2
Louisville	24	12	+10	+41.7
Toledo	39	4	+ 6	+15.4
San Francisco	67	6	+ 6	+ 9.0
Kansas City	...	3 (34)	+ 3	+ 8.8
Dallas-Fort Worth§	69	13	+ 5½	+ 8.0
Adelaide	58	4	+ 4	+ 6.9
Springfield	55	3	+ 3	+ 5.5
Western Ontario	19	5	+ 1	+ 5.3
Jackson-Lansing	59	3	+ 2	+ 3.4
Lancaster	67	4	+ 2	+ 3.0
Southeastern	47	9	+ ½	+ 1.1
Allentown-Reading	44	..	.....	.....
Houston	40	..	.....	.....
Hamilton	22	..	.....	.....
Twin City	66	6	− 1	− 1.5
Columbus	54	3	− 5½	−10.2
Outside Competition				
At Large	125	7	+ 7½	.....
In Transfer	23	..	.....	.....
Total A. E. S.	5,748	332	+41½	+ 0.7
Active Membership, August 31, 1952			5,789	

*Subject to correction. †, ‡, §Winners in first, second and third group, respectively, of 1951–1952 membership competition.

GOT A

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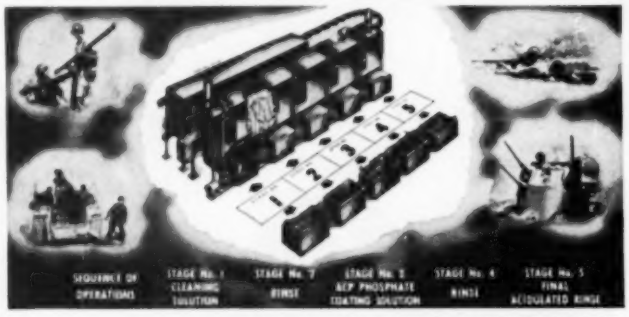
AMERICAN CHEMICAL PAINT COMPANY

AMBLER CHEMICALS ACP PROCESSES PENNA.

Technical Service Data Sheet
Subject: METAL PRESERVATION AND PAINT PROTECTION WITH ACP PHOSPHATE COATING CHEMICALS


SEQUENCE OF OPERATIONS
STAGE No. 1 CLEANING SOLUTION
STAGE No. 2 RINSE
STAGE No. 3 ACP PHOSPHATE COATING SOLUTION
STAGE No. 4 RINSE
STAGE No. 5 FINAL ACIDULATED RINSE

U.S. ARMY PHOTOGRAPHS COURTESY OF "ORDNANCE MAGAZINE"

Typical spray and dip phosphating equipment and some ordnance products that are now given a protective phosphate coating for extra durability under all kinds of severe exposure conditions. Both military and civilian applications of ACP phosphate coating chemicals are shown in the chart below.

SELECTION CHART OF ACP PROTECTIVE COATING CHEMICALS FOR STEEL, ZINC, AND ALUMINUM

METAL	ACP CHEMICAL	OBJECT OF COATING	TYPICAL METAL PRODUCTS TREATED	GOVERNMENT SPECIFICATIONS
STEEL	"GRANODINE" Zinc Phosphate Coating Chemical	Improved paint adhesion	Sheet, iron, or zinc fabricated units or components, automobile bodies, refrigerator parts, washing machines, cabinets, etc.; projectiles, rockets, bombs, rifles, small arms, ball links, cartridge cases, vehicular sheet metal, tank belts and links, recoilless guns, etc.	MIL-S-5002 JAN-C-490, Grade 1 JAN-F-495 U.S.A. 57-8-2, Type II, Class C U.S.A. 51-70-1, Finish 22.02, Class C U.S.A. 50-60-1 16 E4 (Ships)
	"PERMADINE" Zinc Phosphate Coating Chemical	Rust and corrosion prevention	Nuts, bolts, screws, hardware items; tools, guns, cartridge clips, fire control instruments, metallic belt links, steel aircraft parts, carbon steel projectiles and many other components.	MIL-C-16232 U.S.A. 57-8-2, Type II, Class B U.S.A. 51-70-1, Finish 22.02, Class B Navy Aeronautical M-364 U.S.A. 72-53 (See An-F-20)
	"THERMEL-GRANODINE" Manganese-iron Phosphate Coating	Wear-resistance anti-galling, safe break-in of friction or rubbing parts, Rust proofing.	Friction surfaces such as pistons, piston rings, gears, cylinder liners, camshafts, tappets, crankshafts, rocker arms, etc. Small arms, weapon components. Hardware items, etc.	MIL-C-16232 U.S.A. 57-8-2, Type II, Class A U.S.A. 51-70-1, Finish 22.02 Class A Navy Aeronautical M-364 U.S.A. 72-53 (See AR-F-20)
	"GRANODRAW" Zinc-iron Phosphate Coating	Improved drawing, extrusion, and cold forming	Blanks and wholly for cold forming, heavy stampings, tube, tubing for forming or drawing, wire, rod, etc.	———
ALUMINUM	"ALODINE" Protective Coating	Improved paint adhesion and corrosion resistance	Aluminum products of similar design such as refrigerator parts, wall tile, signs, washing machine tubs, etc; aircraft and aircraft parts; facsimiles stacked launchers; helmets, belt buckles, clothes dryers, clothesline, rocket motors, etc., aluminum strip or sheet stock.	MIL-C-5541 (See also QPL-5541-1) MIL-S-5002 AN-F-20 U.S. Signal O.S. 675 16 E4 (Ships) AN-C-178 (See MIL-C-5541) U.S.A. 72-53 (See AR-F-20)
ZINC	"LITHOFORM" Zinc Phosphate Coating Chemical	Improved paint adhesion	Zinc alloy die castings; zinc or cadmium plated sheet or components; hot dip galvanized stock, galvanneal, signs, siding, roofing, galvanized truck bodies, etc.	QQ-P-416 RR-C-82 JAN-F-495 AR-F-20 U.S.N. Appendix 6 U.S.A. 72-53 (See AR-F-20)

CHEMICALS ACP PROCESSES

WRITE FOR DESCRIPTIVE FOLDERS ON THE ABOVE CHEMICALS AND FOR INFORMATION ON YOUR OWN METAL PROTECTION PROBLEMS

CHEMICALS ACP PROCESSES

DETROIT: E. S. Coe, J. A. Mullen, F. E. Seuffert, E. Young
JACKSON-LANSING: Clarence L. Welch
LOUISVILLE: James Hahn, Charles Stoecker
PROVIDENCE-ATTLEBORO: Robert E. McGuinness
TWIN CITY: A. S. Bathke, F. H. Bathke, W. T. Thomson, G. A. Wineberg

Suspensions

CLEVELAND: George C. Bittner, W. J. Cannon, Frank C. Cisco, Jasper Coffaro, Joseph Demyanchik, Sylvester G. Domen, Edward J. Gerbitz, Thomas Hadden, Frank A. Rometti
COLUMBUS: Burt Friedl, P. E. Friehis, Walter V. Hobbs
DETROIT: R. E. Beznitz, E. V. Connell, D. A. Gaines, George Hatala, C. F. Heckenberg, R. T. Hendrich, C. L. Keller, D. J. Snyder, Jr., Raymond Spain, C. E. Tackels, Jr., G. I. Thompson, R. H. Wiechert
INDIANAPOLIS: R. L. Bowers, P. E. Ford, C. L. Hayes, E. D. Hillegass, J. E. Hoff, Jr., H. J. LaCasse, W. R. Laux, Harold Lay, Max Malvase, W. S. Peak, P. E. Richardson, L. R. Van Sell
MELBOURNE: H. J. Merton, W. Wilson
MILWAUKEE: Charles Unke
PHILADELPHIA: Louis Schlossberg, H. A. Adams, E. B. Bordner, A. A. Bradd, J. J. DePasquale, R. D. DiStefano, R. C. Eckert, Attilio Gentile, W. G. Jenner, C. C. Kimber, J. A. Munning, H. F. McIntyre, T. C. Oberndorf, David Polsky, L. M. Raden, C. W. Smith, A. G. Snow, J. A. Teti, Jr., Thomas Wallace, L. M. Watson, J. H. Wilson, Walter Wolf
PROVIDENCE-ATTLEBORO: F. L. Downer, E. L. Hoar, R. V. Rioux
TWIN CITY: Dean C. Thom
WATERBURY: W. R. Kenausis, Jr., F. E. Smith
WESTERN ONTARIO: Ewart Powers

Deaths

NEW YORK: Stanley M. Goodis
SOUTHEASTERN: W. L. Fickling

CORRECTION: Member-at-Large J. C. Van Nuffel was erroneously listed as J. C. Nuffel in October issue.

Branch Speakers

(*Continued from page 1274*)

BRUNO LEONELLI, Detroit Manager, Subject 1
C. WEEKLY, Service Engineer, Subject 1
J. T. INWIN, Chemical Engineer, Subject 2
Subjects:
1. *Present Practices and Probable Trends in Zinc Plating (or Copper, or Cadmium Plating)*
2. *The Acid Phase Preparation of Basis Metals for Electroplating*

A. E. S. ANNUAL PROCEEDINGS

★ 39th Annual PROCEEDINGS (in print)

Technical papers presented at the 1952 Chicago Convention, including ion exchange for chromic acid solutions, waste prevention, filtration, rhodium plating, black nickel plating, engineering materials and materials of construction for plating rooms and waste water treatment systems, vacuum metallizing, current distribution in barrel plating, white brass plating, heavy anodic coatings, instrumentation and three Research Committee reports.

$5.00 U. S. and Canada ★ $8.00 Foreign

★ 38th Annual PROCEEDINGS

Technical papers presented at the 1951 Buffalo Convention. See page 849 of October PLATING (1952) for listing.

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★ SPECIAL PRICE

Room must be made to stock the 1952 PROCEEDINGS. Past copies of the PROCEEDINGS are therefore reduced.

★ 33rd to 37th Annual PROCEEDINGS, 5 Volumes

Technical papers presented at the 1946, 1947, 1948, 1949 and 1950 (International Electrodeposition Conference) Conventions.

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40 Thames Street, New York 6, N. Y.

Secretary.....The Executive Secretary

A. E. S. BRANCHES (Changes only)

GRAND RAPIDS meets second Friday of each month at 7:00 P. M. for dinner; educational session at 8:15. Meeting place to be announced. Secretary, Kenneth Hampel, 136 Elwood Street, Grandville, Mich. Research Finance Committee Chairman, J. D. Kershaw, Jr., 904 Mayhew Wood, S. E., Grand Rapids, Mich.

ST. LOUIS meets second Wednesday of each month in American Hotel, 7th and Market, St. Louis, Mo. Secretary-Treasurer, E. R. Hunleth, 4415 Michigan Avenue, St. Louis, Mo. Research Finance Committee Chairman, Dale Bolyard, 1803 Alfred Street, St. Louis 10, Mo.

TORONTO meets second Friday of each month in Royal York Hotel. Secretary, Robert L. Edwards, 1106 Dovercourt Road, Toronto, Ont., Canada. Research Finance Committee Chairman, C. D. Short, 1281 Pape Avenue, Toronto, Ont., Canada.

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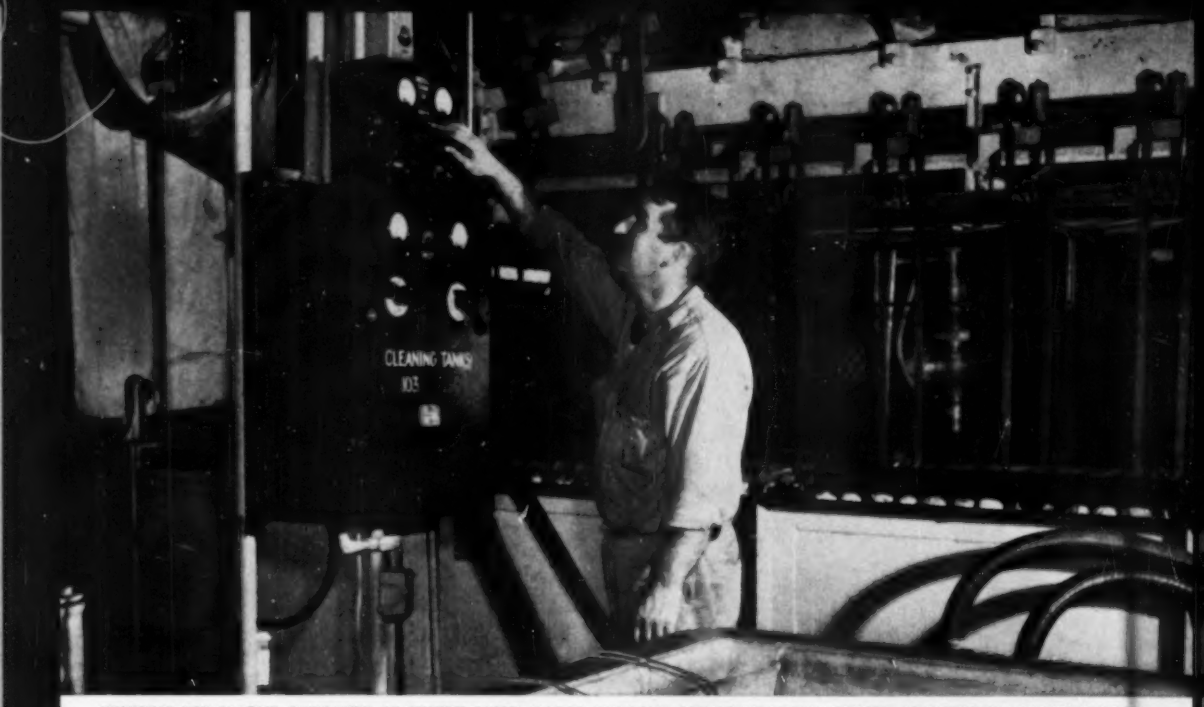


CONTROLS FOR PLATING EQUIPMENT AT GILLETTE SAFETY RAZOR COMPANY ARE CONVENIENTLY LOCATED ADJACENT TO PRODUCTION LINE.

G-E Rectifiers assure steady production reports Gillette Safety Razor Company

G-E PLATING RECTIFIERS, installed in a separate room away from plating area, minimize maintenance. Only occasional inspection and cleaning are required.

"No shutdowns of plating line from current failure"

General Electric metallic rectifiers supply d-c power for electrolytic cleaning, and nickel and gold plating of safety razors at the Boston plant of the Gillette Safety Razor Company.

An automatic conveyor system moves racks of razors through a series of twelve tanks and a dryer. In only 30 minutes, the razors are cleaned, electrolytically cleaned, rinsed, re-rinsed, acid rinsed, nickel plated, rinsed three times, and dried.

To operate with such precise timing, completely dependable equipment is a real necessity. That is why Gillette relies on G-E metallic rectifiers for its d-c power.

STEADY PRODUCTION—"Never have our G-E plating rectifiers caused a production shutdown due to current failure," reports Howard Spaulding, Chief Electrical Engineer at Gillette.

EASY TO MAINTAIN—"Furthermore, the G-E rectifiers require practically no maintenance—only occasional inspection of contacts and switches," Mr. Spaulding adds.

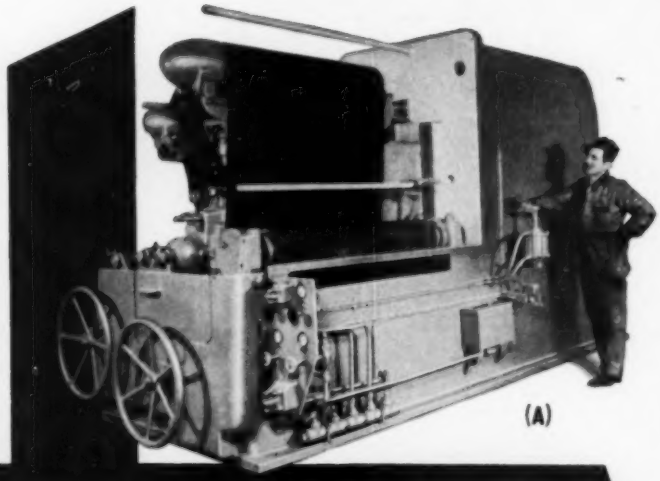
SAVE POWER—Because controls regulate d-c output by controlling a-c input, power is always adjusted to actual load requirements.

FLEXIBLE—Since plating rectifiers need no special foundations, units may be shifted for the most efficient arrangement, as requirements change. G-E plating rectifiers may be tier-mounted if space is at a premium, and additional units can be added if more power is needed.

FOR MORE INFORMATION about G-E metallic plating rectifiers, consult your G-E representative or write to Section 464-11, General Electric Co., Schenectady 5, N. Y.

GENERAL ELECTRIC

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 1380



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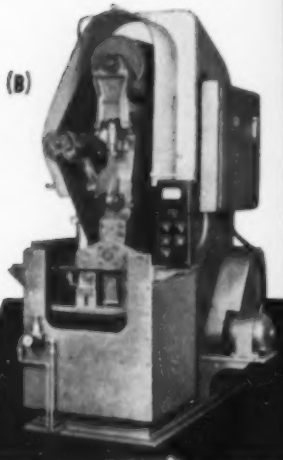

(B)

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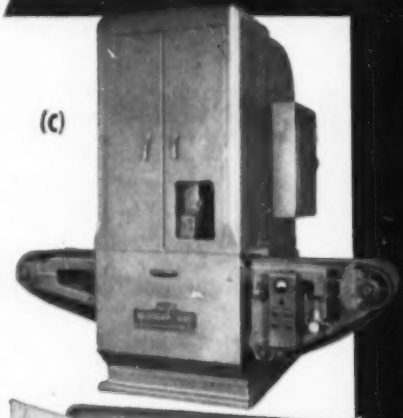

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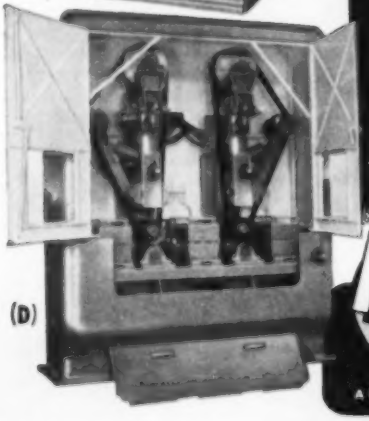

(D)

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Micro-Polish is an amazingly versatile and consistently successful automatic polishing method useful on any job from the prepolishing of low grade steel sheet, to meet high quality job specifications, to the production sharpening and polishing of pruning tools.

Micro-Polish can precision finish any size, shape or length of sheet, strip or blanked stock in ferrous or non-ferrous metals, wood, fiber, plastic, rubber or leather, by wet or dry process.

The typical Micro-Polish equipment shown here demonstrates how Murray-Way engineers have adapted the process to individual job requirements.

A Micro-Polish *giant* used in reclamation grinding of steel strip.

B One of our *smaller* units used in polishing narrow bi-metal stock.

C A versatile unit using belt conveyor to polish a variety of flat stampings and forgings.

D A space saver unit for polishing flat bar stock. Two heads and two grades of belt grain accomplish the complete job without rehandling.

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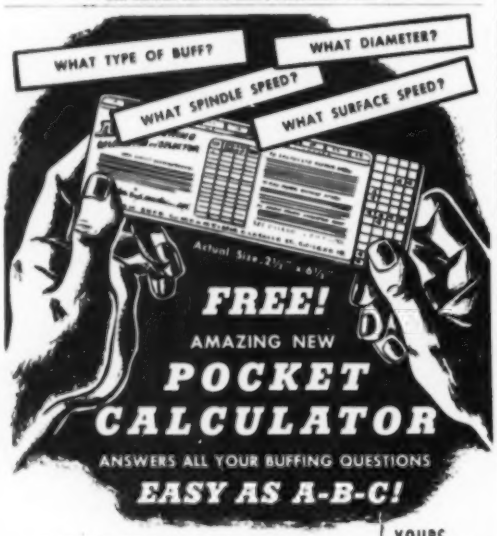

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PITTSBURGH BRANCH, A. E. S., Annual "Milwaukee Night" Party in the Norse Room of the Fort Pitt Hotel at 7:30 P. M. on Saturday, November 8.

34TH ANNUAL MEETING, American Standards Association, Waldorf-Astoria, New York, N. Y., on November 19.

PHILADELPHIA BRANCH, A. E. S., Annual Educational Session (1:30 P. M.) and Banquet (7:00 P. M.) on November 22 at the Broadwood Hotel.

DETROIT BRANCH, A. E. S., Annual Educational Session and Banquet on Friday evening, December 5, and Saturday evening, December 6, respectively.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS' Annual Meeting, Cleveland, Ohio, December 7–10.

NEWARK BRANCH, A. E. S., Annual Educational Session on December 12 at 8:00 P. M., and Christmas Party and Banquet on December 13 at 7:00 P. M., both in the Robert Treat Hotel.

GRAND RAPIDS BRANCH, A. E. S., Annual Educational Session (2:00 P. M.) and Banquet (7:00 P. M.) at the Pantlind Hotel on January 24, 1953.

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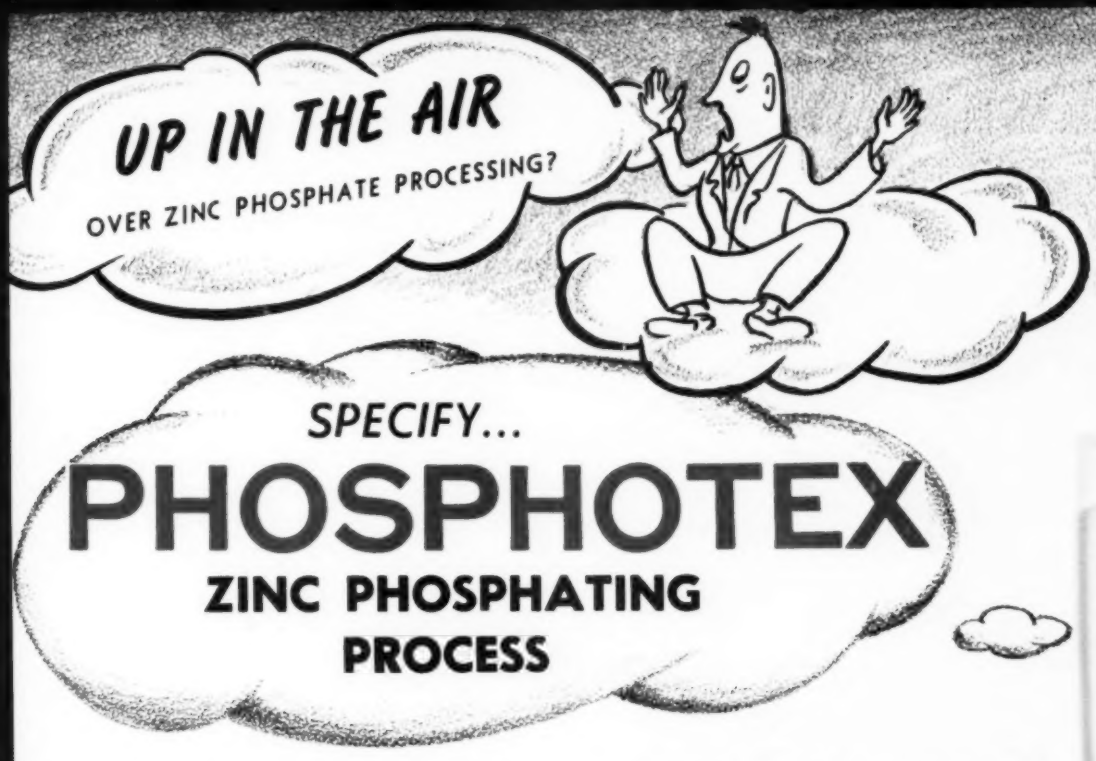

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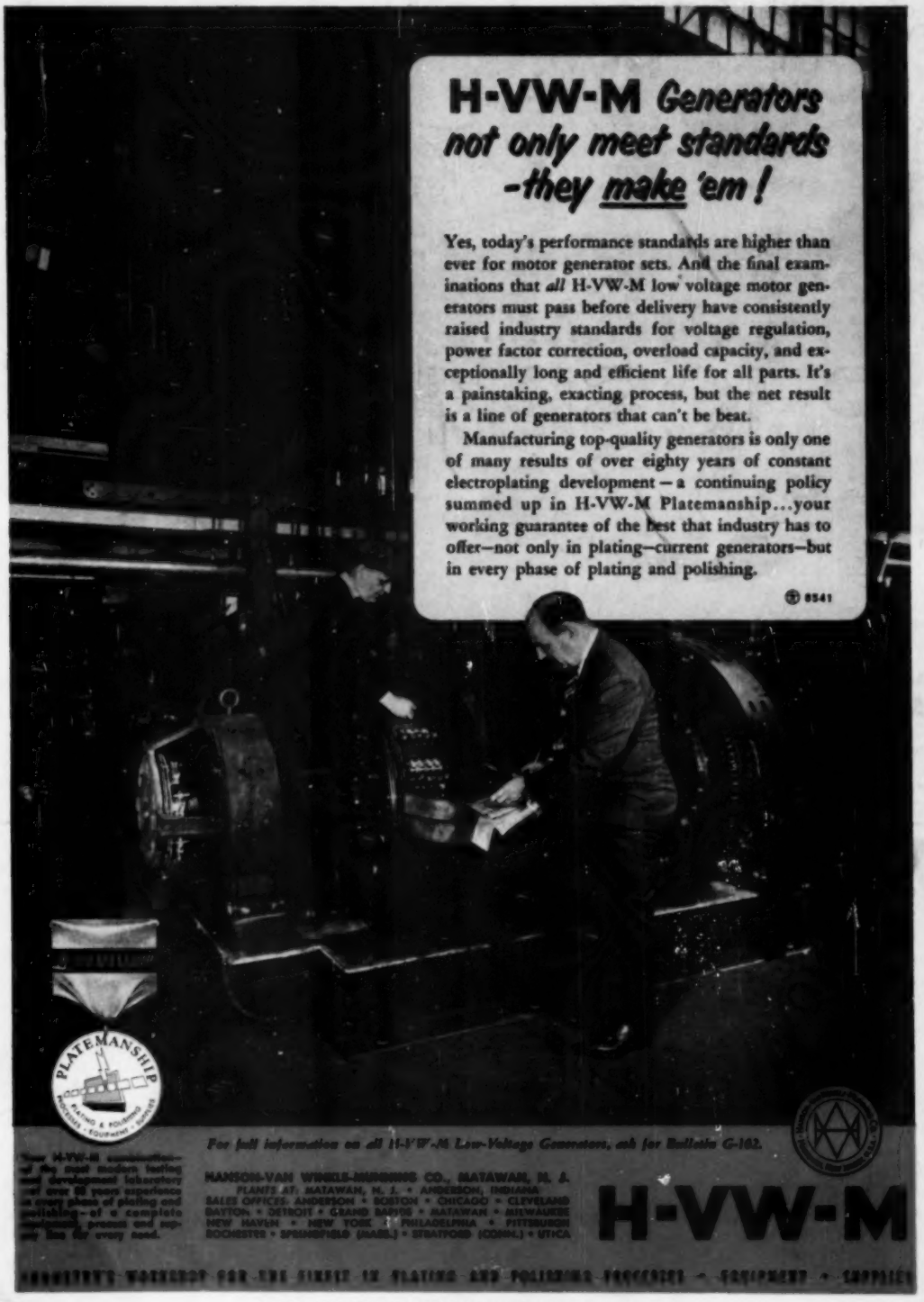
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